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For related information see also *Astronautics*.

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Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1643
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) 1646

89 ASTRONOMY 1646
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1647
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1648
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 1649
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1649
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

99 GENERAL 1649

Note: N.A. means that no abstracts were assigned to this category for this issue.

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CORPORATE SOURCE INDEX I-55
CONTRACT NUMBER INDEX I-69
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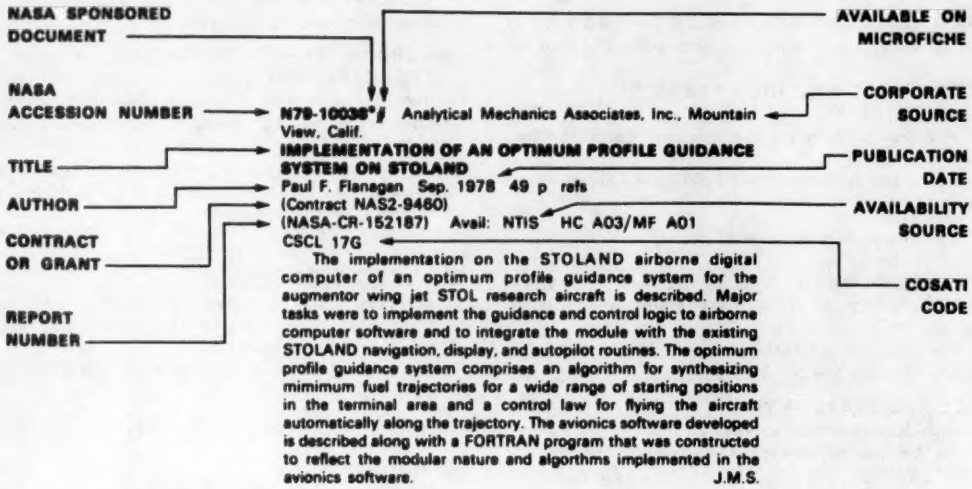
TYPICAL CITATION AND ABSTRACT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N79-10038*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
CORPORATE SOURCE
TITLE
IMPLEMENTATION OF AN OPTIMUM PROFILE GUIDANCE SYSTEM ON STOLAND
PUBLICATION DATE
AUTHOR
Paul F. Flanagan Sep. 1978 49 p refs
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The implementation on the STOLAND airborne digital computer of an optimum profile guidance system for the augmentor wing jet STOL research aircraft is described. Major tasks were to implement the guidance and control logic to airborne computer software and to integrate the module with the existing STOLAND navigation, display, and autopilot routines. The optimum profile guidance system comprises an algorithm for synthesizing mimimum fuel trajectories for a wide range of starting positions in the terminal area and a control law for flying the aircraft automatically along the trajectory. The avionics software developed is described along with a FORTRAN program that was constructed to reflect the modular nature and algorithms implemented in the avionics software. J.M.S.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, AERODYNAMICS OF THE WRIGHT 1903 FLYER
F.E. Culick, California Inst. of Technology, Graduate School, Dept. of Engineering & Applied Science, *1201 E. California Blvd., Pasadena, California* 91109 (NAS 1-15668)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

1.0002, RESEARCH OF TUTORIAL CAPABILITY FOR THE USE OF LARGE STRUCTURAL ANALYSIS SYSTEMS
R.J. Melosh, Marc Analysis Research Corp., *260 Sheridan Ave., Suite 314, Palo Alto, California* 94306 (DF133220; F33615-78-C-3206)

The use of finite-element analysis for the design of structural components contributes significantly to the effectiveness and efficiency of flight vehicles. The effective use of large structural analysis systems requires the user to devote a considerable effort and long calendar time to become familiar with its capabilities or consult some person who is an expert in its utilization. The objective of this effort is to explore the possibility of creating an expert consultant by utilizing the capabilities of a computer. The successful accomplishment of this objective will insure the ready capability to provide the analysis support for present and future aerospace systems, such as F-16, A-10, and YC-15 with a minimum analysis time.

A literature search has revealed that significant advances have been made in other scientific fields in using the methodology of production systems to create an expert consultant. The ideas of production systems will be utilized to investigate the possibility of creating an expert consultant for the use of large structural analysis systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0003, TURBOJET TEST CELL AERODYNAMICS AND EMISSION LEVELS
D.W. Netzer, U.S. Dept. of Defense, Navy, Naval Postgraduate School, *Monterey, California* (DN898053)

(a) To experimentally determine the effects of test cell design, engine operating conditions and fuel additives on the physical characteristics of emitted particulates. (b) To compare results from current smoke opacity measuring devices with quantitative data on particulate size, concentration and composition. (c) To validate the two-dimensional test cell model using both subscale and full-scale test cell data.

(a) Measure exhaust stack particulate levels (size, concentration, opacity, composition) as a function of the following variables; tailpipe stagnation temperature and pressure, cell augmentation ratio, augmentor tertiary air injection, tailpipe particulate levels, and concentrations of fuel additives. Use data to determine optimum methods for reduction of particulate emissions. (b) Correlate opacity measurements with quantitative data on particulate size, concentration and composition. (c) Validate the updated two-dimensional computer code for test cell.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0004, ANALYSIS AND DESIGN OF PENDULUM VIBRATION ABSORBERS FOR HELICOPTERS
G.A. Pierce, Georgia Inst. of Technology, School of Engineering, Dept. of Aerospace Engineering, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NSG 1592)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

1.0005, MANAGEMENT OF TURBULENT FLOW STRUCTURES IN BOUNDARY LAYERS AIMED AT DRAG REDUCTION
H.M. Nagib, Illinois Inst. of Technology, School of Engineering & Physical Science, Dept. of Mechanics & Mechanical & Aerospace Engineering, *3300 S. Federal St., Chicago, Illinois* 60616 (NSG 1591)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

1.0006, RESEARCH ON HELICOPTER ROTOR BROADBAND NOISE
W.L. Harris, Massachusetts Inst. of Technology, School of Engineering, Dept. of Aeronautics & Astronautics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NSG 1583)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

1.0007, TRANSONIC COMPRESSORS VISCOUS FLOW
J.L. Kerrebrock, Massachusetts Inst. of Technology, School of Engineering, Dept. of Aeronautics & Astronautics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NSG 3234)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

1.0008, FLIGHT TRAJECTORY CONTROL INVESTIGATION
M.W. Bird, Lear Siegler Inc., *4141 Eastern Ave., Grand Rapids, Michigan* 49508 (DF141380; F33615-78-C-3607)

The Air Force function for this effort is to study and develop advanced techniques for real-time flight trajectory generation and execution of complex flight paths for advanced military transport aircraft. Future mission requirements and air traffic control constraints will present significant pilot workload and performance problems to flight crews if additional capability is not provided by enhanced flight control system features. The objective of this effort is to develop a set of algorithms suitable for on-board compu-

tation of complex trajectories which also interface with pilot displays to minimize crew duties. This development will provide the Air Force capability to operate in future civil and military environments not possible with current aircraft equipments.

Development of trajectory generation software. Software validation and capability demonstration via computer based engineering simulation. Definition of display requirements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0009, EFFECT OF DESIGN VARIANCES AND MANUFACTURING TOLERANCES ON THE STRENGTH AND LIFE OF MECHANICALLY FASTENED COMPOSITE JOINTS

S.P. Garbo, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DF140840; F33615-77-C-3140)

The efficient joining of the various composite materials involves the identification of parameters affecting joint strength and life, establishment of design approaches for military aircraft applications, and compilation of design data. In many cases, the manufacturing tolerances and quality acceptance limits used in the design of anisotropic composite joints are the result of practices developed from homogeneous metal joint test data implemented in aircraft structures for many years. The objective of this effort is to develop a failure criteria specifically for mechanically fastened anisotropic composite material joints. The payoff will be increased usage and lower production costs of composite military aircraft components without compromising reliability of the composite joints.

The approach taken in this effort will be to perform selective experiments to determine the effect of manufacturing (such as hole clearance and location tolerances) and design (such as irregular fastener spacing) tolerances on the static strength and fatigue life of bolted joints in graphite-epoxy composite structures. Failure mechanisms for the joints will be postulated based on prior experience and experimental observations and combined with accurate stress analyses to develop a failure criterion which shall be verified by additional experiments.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0010, DESIGN AND FABRICATION OF RAFT/H46 INTERFACE FITTINGS

D. Meisner, Air Cruisers Co., *P.O. Box 180, Belmar, New Jersey* 07719 (DN881487; N62269-78-M-2229)

The objective of this task is to design and fabricate the H46 helicopter attachment fittings required to interface with the RAFT system. The fittings are internal to the airframe and are required to structurally transmit the mass and aerodynamic forces to the aircraft frame. This contract supports work unit PH104 Agency Accession No DN 681034.

The approach is to determine the location of the major aircraft frame stations immediately aft of the cargo hatch. Structural bulkheads will be added as required to insure adequate load capability. Fabrication of structural bridges between major frames may be necessary. Emergency release shear pins will be included in the design.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0011, CONTROLLED STRUCTURE ADHESIVE INTERPHASES

J.B. Lando, Case Western Reserve University, School of Engineering, Dept. of Macromolecular Science, *University Cir., Cleveland, Ohio* 44106 (DF053160; AFOSR-78-3692)

AF function - the AF seeks to improve durability and reliability of composite structures, since these materials offer lightweight and reduced manufacturing costs when incorporated into advanced airframe structures. Deficiency - despite many years of intensive study, the nature of the adhesion interphase (in composite materials) and its deterioration by environmental attack, notably by water, has eluded elucidation. The use of adhesion promoters for composite systems consequently has not obtained any firm basis for prediction or optimization. Objective - seek greater understanding of molecular processes involved. How work contributes - to determine adhesion-related properties of monolayers and multilayers of coupling agents formed with known and controlled compositions and structural packing configurations upon well-characterized glass, pyrolytic graphite and resin substrates.

Variations in the composition of the coupling agent and its mixtures and in the technique of layer deposition will be employed to introduce specific layer sequence structures and defect/void regions in the interphase. The interphase will be characterized by electron microscopy. A unique micromechanical tensile test, and other techniques as deemed appropriate to establish the nature and perfection of interphase structures and component interactions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

1.0012, HIGH-SPEED INLET DEVELOPMENT FOR FLIGHT EVALUATION

A.H. Cornish, Centro Corp., *1934 Stanley Ave., Dayton, Ohio* 45404 (DF142290; F33615-75-D-0017)

This work unit is designed to support the effort to develop improved high-speed aircraft. One problem area which exists is the need for an efficient air induction system to operate in the high-speed regime. The goal of this program is to develop the technology necessary to build such an air induction system. Specifically this work unit is designed to modify an existing high-speed inlet model to be used for FY77 testing.

The existing model is to be modified by installing glass sidewalls to aid in flow visualization and additional pressure instrumentation will be installed to further aid in flow analysis.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0013, FLIGHT EVALUATION OF THE AEROACOUSTICS OF GENERAL AVIATION PROPELLERS

G.M. Gregorek, Ohio State University, Columbus Campus, School of Engineering, Dept. of Aeronautical & Astronautical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (NAS 1-15680)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

1.0014, INVESTIGATION OF THRUST RECOVERY FOR POWERED LIFT SYSTEMS

P. Bevilaqua, Rockwell International Corp., *4300 E. 5th Ave., Columbus, Ohio* 43216 (DF052320; F49620-78-C-0069)

AF function - advanced aerospace vehicles. Deficiency - lack of experimental data and a theoretical model for jet thrust recovery for powered lift vehicles in the low-speed range representative of takeoff and landing. Objective - evaluate a new thrust recovery hypothesis by comparing predictions from a mathematical model based on the hypothesis with experimental data which must be generated. How work contributes -verification of the thrust recovery hypothesis will identify the mechanism involved and provide a theoretical method for predicting and comparing the performance of various powered lift systems. New methods for improving powered lift systems will likely result once understanding of the basic phenomenon of thrust recovery is obtained. Also, data will be generated for an important range of flight speeds where no data is presently available.

A mathematical model for thrust recovery will be formulated for a generalized, two-dimensional powered lift system based on the hypothesis that the thrust recovery results from the interaction between the circulation around the wing section and the vorticity in the jet sheet. The aerodynamic forces and moments predicted by this model will be compared with the results of classical analytical methods, limited existing data for low jet thrust coefficients, and new data to be generated in tests at large thrust coefficients and at large deflection angles.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

1.0015, CLOSED-LOOP FLYING QUALITIES ANALYSIS METHODS
F.L. George, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF142270)

This work unit supports development of new flying qualities design criteria for military aircraft. The complex nature of advanced military aircraft demands that flying qualities analysis include the total closed-loop system consisting of airplane, control, displays, and pilot(s). This work unit will improve the capability for including consideration of the pilots' dynamics in realistic mission-oriented flying tasks. The ability to analyze and confidently predict flying qualities during the design of advanced military aircraft will improve mission effectiveness of the final product. Furthermore, it will reduce development costs by reducing the amount of experimental flying qualities testing needed and by eliminating potential design changes involved when flying qualities deficiencies aren't identified until the flight-test program.

Several approaches to analytically accounting for pilot dynamics have been proposed and demonstrated using simplified tracking tasks. These results will be reviewed and refinements or extensions of existing methods needed for realistic flying qualities analysis will be identified. The most promising analytical techniques will be extended as appropriate and their validity for analyzing realistic mission-oriented flying tasks will be demonstrated. The pacing factor in this effort will be the availability of data to validate the revised or newly developed pilot-vehicle analysis methods.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0016, ATMOSPHERIC OZONE DISTRIBUTION AND VARIATION IN ORDER TO ASSESS THE EFFECTS OF AIRCRAFT ON THE OZONE LAYER
Unknown, U.S. National Aeronautics & Space Admin., Office of Aeronautics & Space Technology, Lewis Research Center, *21000 Brookpark Rd., Cleveland, Ohio* 44135 (FA78WAI-893; FA161393 (TRAIS NO.))

In order to provide information on the variability of stratospheric ozone and the variation of ozone concentrations with geographic location which is necessary for assessing the long-term ozone trends, the National Aeronautics and Space Administration, Lewis Research Center (NASA/LERC) shall provide the personnel, facilities, equipment and other material necessary to perform the technical effort.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0017, RESEARCH IN AEROELASTIC OPTIMIZATION
F.K. Bogner, University of Dayton, Research Inst., *300 College Park Ave., Dayton, Ohio* 45469 (DF141890; AFOSR-78-3487)

This work unit supports the technical base functions of the Structural Mechanics Division of the Air Force Flight Dynamics Laboratory. It addresses the problem areas of transonic unsteady aerodynamics, flutter, aeroelastic optimization and integration of aeroelastic disciplines. The goal is to create an array of techniques to integrate the aeroelastic design and analysis of aircraft structures to reduce the cost of design, acquisition and operation of new aircraft. This work unit will obtain substantial improvements in our ability to optimize aircraft structures for unsteady aerodynamic forces, vibrations, flutter, loads and aeroelastic control system interactions.

Initial developments will include the application of transonic unsteady aerodynamic computer programs to strength/flutter optimization problems. Finite-element structural programs will also be modified to automate the input of data and the presentation of results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0018, STUDY OF HANDLING QUALITIES OF LARGE CONTROL-CONFIGURED AIRCRAFT
R.L. Swain, Oklahoma State University, Graduate School, *211-215 Whitehurst Hall, Stillwater, Oklahoma* 74075 (NSG 4018)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

1.0019, A STUDY OF THE AERODYNAMIC INTERACTIONS OF THE TAIL ROTOR AND FIN 15710-E
P.F. Sheridan, Boeing Co., *P.O. Box 16858, Philadelphia, Pennsylvania* 19142 (DA0F9244; DAAG29-78-C-0021)

To conduct a study of wind tunnel model test data to gain an understanding of fin-tail rotor aerodynamic interactions, to identify the gaps in understanding the physical mechanisms at work, and to establish a basis for further analytical and test programs. Relevance -the investigation seeks to study and understand aerodynamic interactions between tail rotors and fins which have caused problems in vibration, performance and flying qualities and is therefore directly relevant to improving helicopter directional control techniques.

A study of all the relevant data acquired by Boeing-Vertol will be carried out and will include both fin and tail rotor forces and moments in both dimensional and non-dimensional forms. Flow visualization records will be examined in relation to the trends of the plotted data and correlative studies will be carried out.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

1.0020, MARITIME PATROL AIRSHIP STUDY
J.A. Eney, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN881665)

To investigate potential application of lighter than air (LTA) vehicles to the current and future requirements of maritime patrol in terms of technical feasibility operational effectiveness and cost.

A system approach will be undertaken to achieve the above objective. Principal areas of the study will be the establishment of mission requirements with associated rationales the performance of missions analysis including trade-offs and operational effectiveness, the generation of vehicle parametrics, a first order examination of life-cycle cost and logistic considerations and a comparison with recent vehicle point designs. Current and near term technology levels will be assumed for structures materials and propulsion technologies. While current and future applications of LTA vehicles could coincide with historic applications methods and approaches to performing these and other missions will be addressed with fresh and innovative thinking.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Systems Command, Advanced Systems Concepts Div.

1.0021, FULL-SCALE AIRCRAFT CABIN FIRE TEST
Unknown, U.S. National Aeronautics & Space Admin., Office of Manned Space Flight, Lyndon B. Johnson Space Center, *Houston, Texas* 77058 (FA78WAI-853; FA161220 (TRAIS NO.))

The purpose of this agreement is to perform full-scale aircrft cabin fire tests to assist in the validation of the FAA/UDRI Aircraft Cabin Fire Model. The validation effort will form the basis for utilization of the simulation model by the FAA. The tests should be varied in a manner that will provide data to the two main subdivisions of any simulation model, the fire spread and the gas dynamics submodels.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0022, EFFECTS OF DAMAGE ON THE AEROELASTIC CHARACTERISTICS OF LIFTING SURFACES
R.O. Stearman, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering, *200 W. 21st, Austin, Texas* 78712 (DF051760; AFOSR-78-3569)

AF function - this research contributes to R.O. 4.2 Aerodynamics, R.O. 4.4 Aeromechanical Elements and R.O. 6.2 Conventional Munitions. Deficiency - the ability to predict the

onset of failure and highly divergent flutter instabilities caused by damaged lifting surfaces is nonexistent. The chief difficulty lies in the aerodynamic modeling and description of the problem, as there exists no aerodynamic theory to treat lifting surfaces with damages in form of surface discontinuity. Objective - to develop methodology for the aeroelastic analysis of damaged fighter aircrafts. To relate the effects of damaged lifting surfaces to changes in aeroelastic characteristics. Contribution - this research will acquire the ability to analytically predict the aerodynamic loading on and the response of damaged lifting surfaces in flow regimes of interest.

Analytical studies will first be carried out to demonstrate that several types of critical damage to aircraft will promote destructive aeroelastic instabilities. An investigation of the different available techniques for identifying the proper unsteady aerodynamic modelling of damaged lifting surfaces will then be accomplished by a combined analytical-experimental effort. This would include a study on recently developed system identification techniques as well as extensive wind-tunnel testing on damaged lifting surfaces to provide insight into the development of analytical flow models useful in aeroelastic analyses.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

1.0023, EXPERIMENTAL DEFINITION OF TOP-MOUNTED INLET FLOW FIELDS

W.W. Rhoades, Vought Corp., Advanced Tech Center Inc, *P.O. Box 5907, Dallas, Texas* 75222 (DF139550; F33615-78-C-3003)

Recent investigations of technology development needs for future air-to-surface fighters suggest that combat survivability can be enhanced significantly by reducing radar cross section. Top-mounted inlets can reduce radar visibility of aircraft. They also facilitate aircraft weight reduction and improved weapon integration. In order to generate top-mounted inlet design criteria, flow fields approaching the inlet must be known. The objective of this program is to generate flow field data typical of top-mounted inlet installations on air-to-surface aircraft.

Existing wind-tunnel model hardware will be modified as necessary and tested at Mach 0.9 and 1.6 in the AEDC PWT 16T facility over a representative set of maneuver attitudes. The model will facilitate testing with variations of leading edge geometry and canopy-fuselage intersection in order to explore a variety of flow fields. A remotely actuated cone probe rake will be used to define inviscid flow properties on one side of the model while boundary layer rakes gather viscous data on the opposite side. The contractor will provide reduced data to USAF engineers who will analyze the data and present the results in a USAF report.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0024, HT ST 78-32 - DRAFT HELICOPTER STRUCTURAL (HSIP) CRITERIA

A.J. Gustafson, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3817)

The objective of this work is to draft a preliminary military specifications to govern the structural integrity of Army helicopters.

MIL STD 1530 Aircraft Structural Integrity Program, Airplane Requirements, which was developed by the Air Force for fixed-wing aircraft, is an excellent approach to structural integrity. This specification will be converted to apply to helicopters and to include composite materials. Major differences in the types of loads, steady and alternating, operating environment and operation usage between fixed-wing and helicopters, necessitate changes to MIL STD 1530. Supporting specifications such as MIL STD 8698, and specifications for landing gear, also have to be modified to meet the structural integrity concept and to bring these specifications up-to-date.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0025, PROVIDE PERSONNEL, MATERIAL, TRAVEL, FACILITIES, EQUIPMENT, AND TESTING SERVICES

Unknown, U.S. Dept. of Defense, Navy, Office of Naval Research, *800 N. Quincy St., Arlington, Virginia* 22217 (FA77WAI-818; FA161237 (TRAIS NO.))

Provide a passive sensor system capable of detecting all electrical storms within 360 degrees of an airport at ranges of 0-25 nautical miles. The system shall be capable of interfacing with the FAA's Aviation Automated Weather Observations System (AV-AWOS). The system shall provide the following storm observations for input to the AV-AWOS: (1) Distance and angle of all lightning storms from an airfield; (2) Position, speed and direction of movement of all storms; and (3) Intensity of each lightning storm.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0026, MASS TRANSFER EFFECTS ON TURBULENT FLOW ALONG SURFACES

J.A. Schetz, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Aerospace Engineering, *Blacksburg, Virginia* 24061 (NSG 1589)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

1.0027, NEW REMOTELY PILOTED VEHICLE, RPV, LAUNCH AND RECOVERY CONCEPTS DEVELOPMENT

R.F. Yurczyk, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF137610; F33615-78-C-3404)

The advanced remotely piloted vehicle (ARPV) has been assigned a definite role in support of combat operations in conventional warfare. A critical link in this role is a capability for high sortie rates and fast turnaround times, which are largely controlled by the effectiveness of the launch recovery system. The objective of this effort is to study several air cushion launch/recovery systems and an air bag skid landing system in terms of system dynamics, operational capability, and cost. This study will allow a valid evaluation of the effectiveness of these systems to be made.

A dynamic model of two basic RPV airframes combined with several different air cushion systems and an air bag skid system shall be made and their dynamic response studied to determine optimum configurations. Preliminary designs incorporating the results of the analysis shall be made. A performance and cost study of the various systems shall be done.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0028, UNSTEADY AIRLOADS ON A SINUSOIDALLY OSCILLATING SUPERCRITICAL AIRFOIL

H. Tijdeman, National Aerospace Lab., *Amsterdam, Netherlands* (DF048340; AFOSR-77-3297)

AF function - aerospace vehicles. Deficiency - there is a lack of reliable experimental unsteady aerodynamic data at transonic speeds. These data are required for analysis and for validation of unsteady transonic aerodynamic theories. Objective - to obtain accurate unsteady aerodynamic measurements at transonic speeds on two-dimensional airfoils. Unsteady wall effects will also be investigated. How work contributes - unsteady transonic aerodynamic data are required for evaluation of flutter characteristics of aircraft, flutter characteristics of helicopter rotor blades, gust response of aircraft performance of helicopter rotor blades, and design of active control systems. The acquisition of accurate unsteady aerodynamic data in which the effects of model scale and facility wall configurations will be evaluated should serve as a standard for the comparison and evaluation of the new generation of calculation methods for unsteady transonic flow.

This is a collaborative program between NASA AMES and the NLR (which has requested nominal Air Force support for their portion of the program). The NLR 7301 airfoil will be investigated in both the NLR transonic tunnel and the NASA Ames

11 by 11 foot transonic wind tunnel. Both the NLR and NASA Ames tests will investigate the amplitude and phase relationships of the pressure distribution and the resultant integrated forces over a range of Mach numbers, angles of attack, Reynolds numbers and reduced frequency. Sufficient data and details of the test facilities pertinent to evaluating wall and scale effects will also be provided as well as details of the test techniques including data acquisition and reduction procedures. It is expected that the close cooperation of the two research laboratories will result in greater progress to improve data accuracy and reliability in a shorter period of time than would be possible by each group working independently.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, INVESTIGATION OF COMPRESSION FATIGUE PROPERTIES OF ADVANCED COMPOSITES UNDER ADVERSE ENVIRONMENTAL CONDITIONS

G. Grimes, Northrop Corp., Aircraft Division, *3901 W. Broadway, Hawthorne, California* 90250 (DN890107; N0001-77-C-0518)

To determine the fatigue properties of AS/3501-6 composites under compressive loading after exposure to adverse simulated service environments.

Conduct a constant cycle fatigue loading test at R equals plus 10 loading conditions (similar to those occurring in the F-18 upper wing skin). Environmental exposure will consist of 140 degrees F, 95% for 40 days. Residual strength and stiffness of unfailed specimens will be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0002, EPITAXIAL NUCLEATION AND GROWTH CHARACTERISTICS OF METALS ON REFRACTORY OXIDE SUBSTRATES (ABBREV)

K. Heinemann, Stanford University, Graduate School, *Stanford, California* 94305 (NCA 2-745901)

A study of the epitaxial nucleation and growth characteristics of metals and refractory oxide substrates by in situ transmission electron microscopy.

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

3.0003, GUIDELINES FOR THE USE OF TITANIUM IN AIRCRAFT TURBINE ENGINES

Unknown, U.S. Dept. of Commerce, National Bureau of Standards, *325 S. Broadway, Boulder, Colorado* 80302 (FA78WAI-831; FA161211 (TRAIS NO.))

Provide financial assistance to NBS for the conduct of a program to prepare background information relating to the use of titanium in aircraft gas turbine engines, that can be used by FAA personnel involved in turbine engine programs.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

3.0004, CERAMIC CAPACITOR MATERIALS

D.A. Payne, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Ceramic Engineering, *2527 Hydrosystems Lab., Urbana, Illinois* 61801

Microstructural modeling of electrical ceramics in terms of equivalent circuits has led to techniques by which properties may be engineered into polycrystalline dielectrics. Recent investigations have been concerned with the control of resistivity distributions within ceramic perovskites. Past work investigated aliovalent chemical doping of BaTiO3, and the production of low resistivity semiconducting thermistors. This work has now been extended to the chemical recompensation of insulating boundary layers within semiconducting SrTiO3. The subsequent formation of internal boundary layer capacitors gives rise to an apparent enhancement of geometric dielectric constant to values greater than 20,000, and loss tangents less than 0.03. Since SrTiO3 is a near linear paraelectric at room temperature, this new type of high capacitance ceramic is extremely stable with respect to temperature, field and time, when compared with high permittivity ferroelectric materials. Investigations are also underway in the system Bi2O3-SnO2.

SUPPORTED BY Transelco Inc.

3.0005, ORIGIN AND EVOLUTION OF SULFUR IN AN ARCHEAN VOLCANO

Unknown, Indiana University, Bloomington Campus, Graduate School, *2805 E. 10th, Bloomington, Indiana* 47401 (NSG 7520)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

3.0006, IDENTIFY AND QUANTIFY RESIDUAL AND APPLIED STRESSES AND MATERIAL FATIGUE DAMAGE UTILIZING ULTRASONICS

Unknown, Pennsylvania State University, University Park Campus, Graduate School, *205 Kern Graduate Bldg., University Park, Pennsylvania* 16802 (NCA 1-22)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

3.0007, ELECTRONMICROSCOPIC STUDY OF SAND EROSION PROCESSES IN METALS

J. Zahavi, Technion, Israel Inst. of Metals, *Haifa, Israel* (DF289620; AFOSR-78-3580)

AF function - increased durability of aircraft and engine materials on advanced weapons systems. Deficiency - the erosion of ductile materials by a stream of abrasive particles has been a subject of practical importance in the operation of aircraft engines in sandy or dusty environments. Research - examination of the eroded surfaces with a scanning electron microscope and an electron probe microanalyzer reveals that sand fragments become embedded in the metal surfaces and that the intrinsic erosion process is the result of a sequence of more localized material removal processes occurring when the metal surface is struck by the sand particles. These local erosion processes are characterized by undermining around hard microconstituents and by cratering. The size of the microconstituents (aluminum-rich phases in Ti-6Al-4V and iron or copper-rich phases in 2024 Al) about 10 microns is of the same order as the embedded particles and the cratered structure formed. The aim of the proposed research is to gain additional understanding of the mechanism of local material removal from eroded metallic surface by means of direct observation of surface morphology structure and composition in T.E.M., S.E.M. and E.P.M.

This research is expected to find answers to the following: 1) How do the microconstituents affect local erosion processes, i.e., local material removal processes? 2) What is the effect of microconstituents, their size, distribution and composition on the mechanism of local erosion processes? 3) What is the connection between grain size and grain boundaries and local material removal processes? 4) Are there any microstructural changes (dislocation density and distribution, grain size and shape) associated with erosion processes? 5) Are there any compositional changes (embedded sand fragments into the eroded surface, phase transformation) associated with erosion processes?

SUPPORTED BY U.S. Dept. of Defense, Air Force, European Office of Aerospace Research & Development

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality As-

surance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, SOLID-PROPELLANT ROCKET MOTOR INTERNAL BALLISTIC PERFORMANCE VARIATION ANALYSIS
R.H. Sforzini, Auburn University, School of Engineering, Dept. of Aerospace Engineering, *Auburn, Alabama* 36830 (NCA 8-132)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

4.0002, PRECISION OPTICAL PATH ALIGNMENT SYSTEM
W.B. Simpson, Boeing Co., Boeing Aerospace, *220 Wynn Dr., P.O. Box 1470, Huntsville, Alabama* 35807 (DA0F1378; DAAK40 78 C 0037)

Development of a precision optical path alignment system (POPAS) for improving the line-of-sight (LOS) stability of the stabilized mirror airborne laser (SMAL) system.

Apply the error measurement system (EMS) hardware and technology developed under contract DAAK-76-C-0445-10 to effect a reduction in LOS error due to vibration in the SMAL system.

SUPPORTED BY U.S. Dept. of Defense, Missile Research & Development Command, Guidance & Control Directorate

4.0003, LOW SCAN ANGLE PERFORMANCE OF AIRBORNE FLUSH-MOUNTED COMMUNICATION ANTENNAS
V.P. Cable, California State University & Colleges, California State University, Northridge Campus, School of Engineering, Dept. of Engineering, *18111 Nordhoff St., Northridge, California* 91324 (DF052080; AFOSR-78-3624)

AF function - worldwide communication. Deficiency - good design techniques for antennae suitable for communication between supersonic aircraft and satellite are not available. Objective - design techniques for flush-mounted high gain, wide scan antennae. How work contributes -computer models for electronically steerable arrays including fuselage structure interaction will supplement experimental studies of size and placement.

The work proposed here will be a theoretical study of diffraction and mutual coupling effects in finite sized flush-mounted scanning arrays and will lead to a model which predicts hemispherical scan coverage for a flush array mounted on an elliptic fuselage. The gain patterns for these antennas for near endfire scan (horizon) will receive major attention and applications of high-frequency (GTD) techniques will be used to study fuselage and array truncation effects on these patterns. The application of a hybrid moment method/GTD technique will also be considered in analyzing the mutual coupling and scan loss effects for the near endfire case.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0004, THE DESIGN METHODOLOGY OF DISTRIBUTED COMPUTER SYSTEMS
C.V. Ramamoorthy, University of California, Berkeley Campus, School of Engineering, Dept. of Electrical Engin & Computer SC, *Berkeley, California* 94720 (DF052470; AFOSR-78-3630)

AF function - data processing for avionics. Deficiency - software engineering tools for distributed data processing are inadequate for efficient exploitation of inexpensive hardware. Objective - develop software engineering tools for distributed processing systems. How work contributes - successful completion of this research will establish basis of design theory for distributed computer systems.

The research will develop a design methodology to establish a basis for design theory for the development of distributed processing systems. The design methodology will provide guidelines and design laws for the systematic design and construction of distributed processing systems such that the users' requirements are satisfied. The philosophy behind the approach is multifunctional, multi-level modeling of a distributed processing system. The research will develop models and techniques for the formal specification, decomposition, testing and validation of a distributed system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0005, REAL-TIME HARDWARE DESIGN FOR ADAPTIVE DIGITAL VIDEO BANDWIDTH COMPRESSION
R.L. Danielson, University of Santa Clara, School of Engineering, Dept. of Electrical Engineering, *Santa Clara, California* 95053 (NCA 2-685905)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

4.0006, ROBUST PROCEDURES FOR COMMUNICATION DATA
P. Papantonikazako, University of Connecticut, Storrs Campus, Graduate School, *Storrs, Connecticut* 06268 (DF053490; AFOSR-78-3695)

AF function - radar signature recognition, remote sensing, image encoding, data compression, and performance monitoring of networks. Deficiency - improvements are needed in the techniques of signal estimation and image processing in the presence of unpredicted interference and abrupt changes. Objective - develop estimators that are 'robust' in the presence of statistically 'contaminated' communication data. How work contributes - this research will allow for better design of communication systems and signal processing techniques.

Solutions to the following problems will be attempted. (1) Robust estimates for mixtures and spectral parameters will be designed. (2) Robust smoothers for time series with stable performance qualities will be further studied. (3) Robust estimation and its relation to universal source coding will be studied. This allows for source encoding schemes to be studied with respect to their smoothness, and new encoding schemes characterized by such smoothness can be considered. (4) Robust network monitoring algorithms, which deals with the performance evaluation of network under possible substantial load fluctuations, will be developed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0007, LOW-TC SUPERCONDUCTIVITY RESEARCH/ NASA
R.J. Soulen, U.S. Dept. of Commerce, National Bureau of Standards, *Washington, District of Columbia* 20228 (2213431)

Project objective: (1) develop durable Josephson devices, (2) investigate electrodynamics of Josephson devices to evaluate their utility in voltage standards and other superconducting devices, (3) investigate high-frequency response of Josephson devices.

Project approach: this project complements project 2110108, especially on project objective (1). Objectives (2) and (3) involve the examination of the electrodynamics of Josephson devices (isolated junctions, SQUID magnetometers and circuits) fabricated from low-tC superconductors so that the response above and below the gap frequency can be conveniently studied at microwave frequencies.

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

4.0008, DEVELOPMENT OF MOLDED, COATED FABRIC JOINTS
L.H. Olson, Georgia Inst. of Technology, School of Engineering, Dept. of Textile Engineering, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NSG 2356)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

4.0009, ADAPTING A GENERAL RADIATIVE TRANSFER PROGRAM TO ATMOSPHERIC PROBLEMS

A.C. Cogley, University of Illinois, Chicago Circle Campus, School of Engineering, Dept. of Energy Engineering, *Box 4348, Chicago, Illinois* 60680 (NCA 2-330901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

4.0010, CONTROL STRATEGIES FOR COMPLEX SYSTEMS FOR USE IN AEROSPACE AVIONICS

J.B. Cruz, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engin, *2527 Hydrosystems Lab., Urbana, Illinois* 61801 (DF052650; AFOSR-78-3633)

AF function - design of Air Force control systems. Deficiency -the increased demand on the control system to maintain desired performance tends to amplify the undesirable effects of parameter uncertainty or unpredictable parameter change. Objective - the objective of this research program is to develop new methods for counteracting the effects of uncertainties on the control of systems. How work contributes -successful development of these methods would give improved system performance for AF systems through more effective control.

Two approaches will be investigated, one regarding system parameters as unknown, but deterministic, the other models the parameters as random variables. In the first case, the principal methodology is sensitivity theory, encompassing regular and singular perturbation methods. The second case is based on stochastic control and dual control theory. The problems to be investigated include a dual control problem where the control is a function of the plant state only, an algorithm which would tend to be robust and reliable with respect to minor failures in the controller and modelling errors in the plant, how control structure redundancy may be exploited to enhance reliability, various singularly-perturbed problems using a polynomial-matrix system descriptions, and finding simple approximate relationships between the gain coefficients and the singular perturbation parameters.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0011, DEVELOP AIRBORNE NADIR LASER FOR MOLECULAR POLLUTANTS IN TROPOSPHERE

R.T. Thompson, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Support Lab., Remote Monitoring Methods Br, *P.O. Box 15027, Las Vegas, Nevada* 89114 (J620A-39)

OBJECTIVE/APPROACH: Design, construct and interpret data from airborne nadir-viewing, laser differential adsorption systems. A CO2 laser system will be developed to measure ozone. A frequency doubled dye laser system (approx. 300 nm) will be developed to monitor sulfur dioxide. The use of differential absorption systems to monitor selected tracer gases will be investigated.

The systems each consist of two lasers, the wavelengths of which have been selected to optimize the difference in reflected signal due to the wavelength dependence of the pollutant or tracer gas. A computer code has been developed to simulate data tapes using a model atmosphere. Simulations are used to develop interpretive software and analyze system parameters.

FINAL OUTPUT: Report on operational monitoring systems capable of remotely determining pollutant gas concentrations.

RESULTS TO DATE: A prototype O3 system was ground tested successfully on a topographic target. A paper has been written evaluating candidate tracer gases which can be monitored using the differential absorption system.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Support Lab.

4.0012, CHANGE IN REFLECTIVITY OF METALS UNDER INTENSE LASER RADIATION

W.T. Walter, Polytechnic Inst. of New York, Brooklyn Campus, Graduate School, Dept. of Electrical Engin & Electrophys, *333 Jay St., Brooklyn, New York* 11201 (DF051660; AFOSR-78-3557)

AF function - aircraft operating in future hostile engagements must be protected from intense laser radiation. High-power lasers are also used for cutting, machining, drilling, heat treating and welding metals. Deficiency - the absorption of energy by the metal is critical in all cases and experimentally the reflectivity of a metal has been observed to decrease rapidly, by as much as a factor of 10, during a laser pulse of sufficient intensity. Objective - this research seeks to understand the mechanisms which couple energy from the electromagnetic beam into the material surface and results in the rapid loss of reflectivity. How work contributes - once the mechanisms are known, progress toward optimizing reflectance or absorption can be made by altering the chemistry and or microstructure of the materials.

An experimental program which is closely tied with an ongoing theoretical effort will be initiated. Reflectivity measurements of metal surfaces under intense laser radiation will be conducted in real time using reflected laser light and a probe light source. Time histories of metal surface reflectivity during laser irradiation will be compared with theoretical predictions of nonlinear effects, surface deformation and vaporization or plasma blowoff to attempt to explain the steep initial decrease in metallic reflectivity.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0013, MANUFACTURE OF MULTIPLEX TERMINALS BUS COUPLERS CABLE CONTROL UNIT

Unknown, Telephonics, *Huntington, New York* (DN881614; N62269-75-C-0488)

The objective of this task is to procure multiplex terminals, bus couplers, and a cable control unit for use with the basic program's general purpose multiplex system in the development of generic avionics suits for specific avionic platform systems. This contract supports work unit ZC909, Agency Accession No. DN 681082.

Manufacture multiplex terminals, bus couplers, and a cable control unit conforming to specifications.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Communication Navigation Tech Directorate

4.0014, CONFORMAL ARRAYS AND HEMISPHERICAL COVERAGE ARRAYS

J. McIlvenna, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF903720)

The objective is to provide the Air Force with new, lightweight, broadband, flush-mounted antenna technology for airborne and aircraft-to-satellite communications. The new designs are specialized to provide coverage from the zenith to horizon. Three areas will be investigated: conformal microstrip antennas at UHF, surface modification to augment hemispherical coverage at SHF and the use of single aperture, multi-frequency elements at SHF. Specifically, work will extend angular coverage of UHF microstrip antennas, and construct both a one-dimensional and a two-dimensional scanning array of dual frequency elements.

Microstrip antennas at UHF suffer from narrow bandwidth and scan only over restricted angles. Techniques that combine microstrip antennas with surface wave technology to provide low-angle coverage will be investigated in a theoretical and experimental program. Efforts to provide better matching networks for a dual frequency horn antenna will culminate in the building of a linear array of such apertures in-house, and also a full two-dimensional scanning array.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0015, OCEANOGRAPHIC AND ENVIRONMENTAL DATA ACQUISITION AND MONITORING SYSTEM DEVELOPMENT

D.G. Dimmler, U.S. Dept. of Energy, Brookhaven National Lab., *Upton, New York* 11973 (000920)

This project is concerned with the development of new methods and techniques in systems for continuous large scale and automated data acquisition, monitoring, data verification and experimental control in real-time of oceanographic parameters. Emphasis is given to the following subjects: (1) Development of techniques and instruments concerning filtering sampling, integration and averaging of parameters from sensors; (2) techniques and instrumentation for data communication systems which are suitable for transmission of oceanographic data from remotely located stations and for commanding remotely located stations. Special attention is given to telemetry communication within line-of-sight and satellite communication for longer distances; and (3) application of computer techniques for the purposes of experiment automation, real-time data acquisition, control of experimental equipment and sensors as well as improved data verification in real-time. Adequate techniques and devices for automated data acquisition and monitoring instrumentation systems which can be used for collection of correlated data from remotely located stations in real-time are still not generally available. These systems are mandatory for environmental and biological studies in the coastal regions. Essential requirements for such systems are (1) low power consumption data acquisition and monitoring stations operating in situ which are operated remotely in command-response mode from an accessible central station; (2) development and implementation of valid data sampling, averaging and reconstruction techniques; (3) real-time monitoring of the experimental progress from a central, accessible station; (4) command-response telemetry connection between the central, accessible station and the remote stations; and (5) techniques for verification and ordering of collected data in real-time.(1)(a) A Controllable Automated Environmental Data Acquisition System now used routinely in the Coastal Boundary Layer Transect Experiment in Physical Oceanography. (b) A processor for real-time, in-situ data processing. (c) A Central Station Operation System. (2) Development of large-scale low-power, in situ memories. (3) Investigation of telemetry link beyond line-of-sight distances. (4) Investigation of Momentum Flux Measuring System. (5) Development of above techniques. (Text Abridged)

SUPPORTED BY U.S. Dept. of Energy, Div. of Biomedical & Environmental Research

4.0016, AIRCRAFT TURBINE EMISSION MEASUREMENTS

W.F. Herget, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab., Emissions Measurement & Characterization Div., Special Techniques Group, *Research Triangle Park, North Carolina* 27711 (G712B-BA-41)

OBJECTIVES: Determine reasons for apparent discrepancy between NO concentrations in jet engine exhausts as determined by non-extractive electrooptical methods and by extractive probe methods.

APPROACH: Several types of non-extractive electrooptical instruments and probe systems will be used to measure NO concentrations in heated cells and in flat-flame burners. Experiments will be conducted to determine which type of measurement gives the most accurate results and to determine the reasons for differences between the results obtained by the different methods.

CURRENT PLANS/PROGRESS: This two-year program is to be jointly funded by the EPA, Navy, NASA, Air Force and FAA, with the FAA acting as the lead agency. A procurement document has been prepared and contract is expected to be awarded during FY 77.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

4.0017, LARGE REFLECTOR ANTENNA ANALYSIS RESEARCH

J.F. Kauffman, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Electrical Engineering, *Raleigh, North Carolina* 27607 (NSG 1588)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

4.0018, TRENDS IN DIGITAL COMPONENT TECHNOLOGY AND THEIR EFFECTS ON SEQUENTIAL COMPUTER PROCESSING RATES

G.M. Dick, University of Pittsburgh, Johnstown Campus, Undergraduate School, Dept. of Engineering Technology, *Johnstown, Pennsylvania* 15902 (DF051450; AF-AFOSR-3540-78)

AF function - aerospace vehicle design and operation. Deficiency -three-dimensional aerodynamic design is at present not computationally feasible. Opportunity - new computer architectures and associated computational algorithms might be able to do the problem. How work contributes - by establishing limits of advantage attainable by specialized computer architecture.

Computational algorithms contain both sequential and vector operations. Pipeline and parallel computer speed can be limited by necessary sequential operations. The proposal attempts to estimate the needed and attainable speed of sequential computation in order to do three-dimensional aerodynamic design. This study will directly address processing rates of sequential machines only. Extrapolation of these results to vector machines is not a main item within the investigation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0019, CRITERIA GOVERNING THE OCCURRENCE OF THERMAL ACOUSTIC OSCILLATIONS IN CRYOGENIC FLOW LINES

J.A. Liburdy, Clemson University, Graduate School, *Tillman Hall, Clemson, South Carolina* 29631 (NSG 2352)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

4.0020, PRELIMINARY DEVELOPMENT OF DIGITAL SIGNAL PROCESSING TECHNIQUES FOR MICROWAVE RADIOMETERS

N. Matthews, Le Moyne Owen College, Undergraduate School, Dept. of Education, *807 Walker Ave., Memphis, Tennessee* 38126 (NAS 1-15676)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

4.0021, DICE THROW DATA ANALYSIS (HARD FLUSH AIRCRAFT SHELTER)

J.C. Pyle, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF190550; F29601-77-C-0086)

The objective of this project is to analyze the dice throw data for the Boeing Aerospace Company's hard flush aircraft shelter concept model. The test phenomenology and its implication on the Boeing shelter design will be based on the data analysis. This project will result in a report summarizing data results, analysis results and analysis/test correlation.

This project will require data review, damage review and assessment, prediction analysis review and assessment, new analysis based on measured load data in overpressures and soil pressures, and analysis/test correlation. The dice throw test simulated the air overpressure and ground shock weapons effect on the one-third scale hard flush aircraft shelter. The test prediction analysis approach was the same approach as the design analysis for these weapons effects. The same approach or an expansion of it will be used for analysis/test correlation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

4.0022, CIRCULATION CONTROLLED VERTICAL AXIS WIND TURBINE AND VORTEX CONCENTRATOR
R.E. Walters, West Virginia University, School of Engineering, Dept. of Aerospace Engineering, *Morgantown, West Virginia* 26506 (E(40-1)-5135)

The objective of this project is to evaluate the technical and economic feasibility of a vertical axis wind turbine (VAWT) having straight blades constructed with circulation controlled airfoil sections. Both theoretical and experimental analyses are being used to attain this goal. The specific project steps and objectives are as follows: (1) to design and construct a VAWT test model and associated instrumentation; (2) to perform indoor tests to determine machine tare drag components and blade drag and lift forces, and blade moments; (3) to move the test model VAWT outdoors to the WVU test site and conduct machine performance tests in the ambient natural winds; and (4) to analyze and modify as necessary two theories used to predict the performance of the VAWT, namely the multiple streamtube approach and the WVU-developed vortex theory analysis. The results of the project will be to experimentally determine the actual performance of a VAWT and its component parts, and to evaluate the concept of circulation controlled blades on the VAWT. This experimental data will be used to develop the vortex and multiple streamtube theories into useful design tools which can be used to predict the performance of any vertical axis wind turbine design with considerable confidence. A vortex concentrator wind turbine has also been evaluated theoretically. This portion of the project is complete; results showed doubtful economic viability when compared with other wind energy conversion systems.

SUPPORTED BY U.S. Dept. of Energy, Div. of Solar Technology

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, TO QUANTIFY INTENSE AURORAE - CORRELATIONS OF CHARGED PARTICLES AND ELECTRIC FIELDS, AND COORDINATED S3-3 AND GEOS MEASUREMENTS
P.F. Mizera, Aerospace Corp., Space Sciences Laboratory, *P.O. Box 95085, Los Angeles, California* 90045 (ATM78-03600)

This research program supported here represents a unique opportunity to investigate one of the most important features of the earth's magnetosphere: the auroral acceleration process. The joint University of California at Berkeley and The Aerospace Corporation effort will combine the electric field and auroral particle data in order to map the high latitude electric field. The S3-3 satellite is the only scientifically instrumented spacecraft to fly in the high latitude region of space between approximately 300 km to approximately 8000 km where the strong auroral electric fields exist. For the first time, the interface region between the earth's distant plasma sheet and the discrete auroral arcs of the earth will be described in terms of plasma distributions. The modification of the distribution functions by the DC electric field as a function of altitude and local time is the key to the understanding of the intense aurorae. A thorough, coordinated study will provide a satisfactory description of the basic auroral morphology.

The joint Berkeley-Aerospace effort is divided into two categories. The first is directly related to the magnetospheric-ionospheric coupling which is a prime International Magnetospheric Study objective and the second is a direct comparison of electric field and auroral particle observations.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0002, GLOBAL ATMOSPHERIC ENERGY INPUT DUE TO ELECTRONS PRECIPITATED BY MAN-MADE VLF EMISSIONS
A.L. Vampola, Aerospace Corp., Space Sciences Laboratory, *P.O. Box 95085, Los Angeles, California* 90045 (ATM77-28187)

This grant provides partial support for data processing and analysis for a study of energy input into the upper atmosphere due to electrons precipitated by interaction with man-made electromagnetic waves. The study covers a new area of investigation: the modification of the magnetospheric energetic electron population by very low frequency (VLF) waves from ground-based transmitters and power-line harmonics. The data involved was obtained by a magnetic electron spectrometer on the S3-2 satellite during the period December 1975 to present. As part of the tasks, the data will be reduced, processed to provide ephemeris and magnetic aspect, and furnished to the National Space Science Data Center for use by other investigators.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0003, OPTICAL OBSERVATIONS AT THE BIG BEAR SOLAR OBSERVATORY
H. Zirin, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (NSG 5314)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0004, IONOSPHERIC ACCELERATION MECHANISMS
R.D. Sharp, Lockheed Missiles & Space Co. Inc., Research Laboratory, *1111 Lockheed Way, Sunnyvale, California* 94088 (ATM77-09853 A01)

This grant will support the analysis of selected portions of the data from the energetic ion mass spectrometer experiment on the Air Force satellite 1976-65B. The experiment measures ions in the energy range 0.5 to 16.0 keV and separates the ionic components on the basis of mass per unit charge. The central focus of the investigation will be the understanding of the mechanisms responsible for the energization of ambient ionospheric ions which have been observed flowing upward out of the ionosphere into the magnetosphere with energies in the keV range. One important objective of the research will be the identification of the origin of the trapped particles in the Van Allen radiation belts.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0005, VERY LOW ENERGY DIFFERENTIAL ANALYZER
R.E. Laquey, Maya Development Corp., *San Diego, California* (DF580420; F19628-78-C-0012)

AF function - knowledge of the cold particle population in the ionosphere and magnetosphere and their interaction with AF satellites. Deficiency - above 2000 km, traditional integral methods of determining the low energy charged particle distributions are seriously degraded because of low ambient concentrations. Objective - to design a very low energy differential charged particle analyzer (0.1 eV to 10 eV) to be flown on Air Force satellite missions which extend beyond a few thousand km. How research contributes - the instruments developed as a result of this work will be of great importance to all high-altitude Air Force satellite missions, in particular, flights at synchronous altitudes.

Design of a very low energy particle detector will be carried out. Calibration and test procedures will be developed. Portions of the particle counting input circuitry will be designed and fabricated, including amplifier discriminator electronics and a high-voltage power source for use with a spiral electron multiplier.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0006, CHATANIKA RADAR CORRELATIVE ANALYSIS
R.R. Vondrack, S R I International, *300 Ravenswood Ave., Menlo Park, California* 94025 (DF580700; F19628-78-C-0081)

AF function - communication, surveillance, and reconnaissance. Deficiency - inadequate knowledge of electric fields seriously degrade AF systems at high latitudes. Objective - to deter-

mine ambient electric fields, current flow and charged particle density and temperature from ground-based observations in the high latitude ionosphere and perform a correlative analysis with satellite observations. How research contributes - the deduction of the electrical structure of the ionosphere below the S3-2 satellite together with the satellite measurements will lead to improved ionospheric models in vicinity of auroral arcs and the mid latitude trough.

Correlative data from the Chatanika radar and the S3-2 satellite is analyzed to determine ionospheric electric fields, currents and plasma density and temperature. The results will be used to modify and update existing ionosphere electron density models.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0007, VERY-LOW-FREQUENCY PROBING OF THE MAGNETOSPHERE FROM SIPLE STATION, ANTARCTICA
R.A. Helliwell, Stanford University, School of Engineering, Dept. of Electrical Engin, *Stanford, California* 94305 (DPP76-82646 A01)

This is a continuation of NSF Grant DPP7682646. This program will involve initial winter-over operations at Siple Station, Antarctica, including tests and coordinated use of a variety of experimental equipments. Major efforts will be devoted to initial operations of the Jupiter VLF transmitter, a new system which includes previously unavailable amplitude modulation of the radiated signal. Jupiter is essentially a high-gain audio amplifier. At low power, it can operate broadband over the range 1-30kHz, instead of within the 1 kHz steps of the present system. Transmitter operations will include further investigation of the magnetospheric response to changes in transmitter power and initial studies of the response of the magnetosphere to transmission at multiple frequencies. A major objective will be continued studies of wave-induced particle precipitation so as to better determine how the observed types of precipitation events contribute on a large scale to a loss of energetic particles from the magnetosphere. An improved monitoring system will be available for handling and displaying photometric and VLF wave information on precipitation activity. Passive VLF studied of magnetospheric thermal plasma particle dynamics will continue as part of international cooperative observing campaigns, and as a source of information on magnetospheric parameters for active probing experiments. Special VLF transmissions to satellites will continue as part of in situ studies of the details of magnetospheric wave-particle interactions. In the 1979-80 summer season, active and passive VLF probing will be carried out at Siple in support of a special rocket-balloon campaign to study wave-induced particle precipitation effects in the ionosphere and sub-ionosphere. Logistics support is required for both summer and winter-over operations at Siple Station.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

5.0008, HALOGEN OCCULTATION EXPERIMENT (HALOE) SATELLITE SCIENCE TEAM PARTICIPATION
R.J. Cicerone, University of California, San Diego Campus, Graduate School, *P.O. Box 109, La Jolla, California* 92037 (NSG 1590)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0009, RADIOWAVE DIAGNOSTIC STUDIES OF THE EARTH'S PLASMA ENVIRONMENT
V.H. Rumsey, University of California, San Diego Campus, Graduate School, Dept. of Applied Physics & Info Science, *P.O. Box 109, La Jolla, California* 92037 (ATM78-06770)

This grant will use the technique of interplanetary scintillation (IPS) to probe the solar wind in regions normally inaccessible to spacecraft. This technique allows an estimate of the solar wind velocity (and its random component) and the spatial spectrum of electron density. An observatory consisting of three widely spaced antennas operating at 74 mHz has been set up under previous NSF grants. It is well suited to measuring IPS at solar distances of 60 to 250 solar radii (Ro). In this range it is possible to concentrate on high latitudes observations.

The observations outside of 60 Ro will be regular and continuous. Thus they will be used to study the latitude structure of streams and by comparison the latitude structure of the corona. As the solar activity increases and transients become increasingly important, it will also be possible to map the spatial structure of these events. Observations inside 60 Ro are more complex because the solar wind is more variable. However, by using multiple antennas and/or multiple frequencies the velocity and spatial spectrum can be reliably estimated. The basic objective is to study the development and evolution of turbulence in the acceleration region of the solar corona as it expands to become the solar wind.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0010, PROPOSED UNIVERSITIES REGIONAL APPLICATIONS PROGRAM WORK PLAN - FY 79
J.E. Estes, University of California, Santa Barbara Campus, School of Letters & Science, Dept. of Geography, *Santa Barbara, California* 93106 (NSG 2358)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0011, CONCEPTUAL DESIGN AND PRELIMINARY DEMONSTRATION OF A PRIME AGRICULTURAL LAND COMPONENT OF AN INTEGRATED REMOTE SENSING SYSTEM
J.E. Estes, University of California, Santa Barbara Campus, School of Letters & Science, Dept. of Geography, *Santa Barbara, California* 93106 (NCA 2-680901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0012, SATELLITE STUDIES OF SEVERE CONVECTIVE STORMS
T.H. Vonderhaar, Colorado State University, School of Engineering, Dept. of Atmospheric Science, *Fort Collins, Colorado* 80523 (ATM78-00530)

This research will measure the three-dimensional distributions of temperature and moisture of severe weather events and convective storms from meteorological satellite data using the special techniques that have been developed.

Comparisons will be made using a special network of radiosondes. These results will add to the basic understanding of severe storms and their environments, they should aid the design of mesoscale field program and provide ideas for forecasting applications.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0013, ULTRAVIOLET MONITORING
R. Donnelly, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (8DJ4 19 35)

PROJECT OBJECTIVE: To initiate planning for UV monitoring and to make first contacts with NOAA/NESS and NASA for further planning.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0014, FLOOD FREQUENCY IN URBAN AREAS
R. Livingston, U.S. Dept. of the Interior, Geological Survey, Water Resources Div, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (CO 68-031)

The frequency of peak flood flows is an important element of designing urban drainage works. Data are lacking for small

watersheds and estimates made from existing data are likely to be substantially in error. The aim is to collect data in typical areas and develop rainfall-runoff relations that can be extrapolated to all small watersheds in the metropolitan areas of the six-county area.

1. To collect data useful in defining relations between run-off and rain-fall intensity and duration of small drainage basins in the six-county area which includes all or parts of Adams, Arapahoe, Boulder, Denver, Douglas, and Jefferson Counties. 2. To study and develop techniques for extrapolating the data both in time and space. 3. modeling rainfall-runoff.

We propose to collect rainfall and runoff data in at least 30 drainage basins in the 6-county area. The basins will be selected to sample the following ranges in basin parameters: (a) Size: 40 acres to 2 square miles. (b) Cover: natural to completely impervious. (c) Drainage appurtenances: fully sewered to non-sewered. (d) Development: natural to fully urbanized, the natural basins being subject to development in perhaps 15 years. Rainfall data will include continuous records of rainfall supplemented by data from standard rain gages. The runoff data will include continuous records of outflow from each basin.

1. Data collection continued at 24 rainfall-runoff sites, 3 runoff only sites, and 3 rainfall only sites. Ten rainfall-runoff sites were discontinued after preliminary data analysis. 2. Aerial photography obtained for 3 basins. 3. Completed modifications of DAVCAT (rainfall-runoff) model. 4. Evaluation of basin characteristics completed for 4 basins. 5. Preliminary model calibrations were begun.

1. Continue data collection at a total of 30 sites. 2. Install 7 additional rain gages and 1 rainfall-runoff gage. 3. Continue preliminary model calibrations and determination of basin characteristics.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0015, ENERGY TRANSPORT IN THE SOLAR ENVELOPE AND ATMOSPHERE

Unknown, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NSG 7511)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0016, SUPERGRANULATION VELOCITY FIELDS AND THEIR RELATION TO MAGNETICALLY ACTIVE REGIONS

K.B. Gebbie, University of Colorado, Boulder Campus, School of Arts & Sciences, Dept. of Astro Geophysics, *1200 University Ave., Boulder, Colorado* 80302 (NSG 5318)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0017, ELECTROOPTICS METEOROLOGY (CLIMATOLOGY)

S.G. Gathman, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880082)

Improve the operational capability of the Navy in its function of assessing the vulnerability of certain strategic and tactical systems produced by clouds, aerosols, water vapor, and turbulence throughout the marine boundary layer by both obtaining the statistics and establishing an oceanic climatology of these parameters.

Existing experimental measurements of EOMET parameters from both the open literature, various project reports, and unpublished cruise data are assembled and edited. These data are used as input parameters to the climatology and as test standards for verification of EOMET models. As these models evolve and are proven accurate, an all-season, world ocean climatology will emerge. In cases where the absence of marine data precludes the testing and acceptance of a model, ocean cruises involving all of the EOMET parameters are undertaken.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0018, CONDUCTING SHORT COURSES IN REMOTE SENSING

C. Cross, State University System of Florida, University of Florida, Graduate School, *Gainesville, Florida* 32601 (NAS13-106)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0019, GROUND-BASED SOLAR OBSERVATIONS FOR THE SOLAR MAXIMUM MISSION (SMM)

J.T. Jefferies, University of Hawaii System, Manoa Campus, Inst. for Astronomy, *2840 Kolowala St., Honolulu, Hawaii* 96822 (NSG 5317)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0020, DATA SYSTEMS TEST EVALUATION AND DATA SETS

T. Murakami, University of Hawaii System, Manoa Campus, School of Arts & Sciences, Dept. of Meteorology, *2444 Dole St., Honolulu, Hawaii* 96822 (NAS 5-25378)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0021, STUDIES OF UPPER-ATMOSPHERE MOTIONS BY UHF

S.A. Bowhill, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *2527 Hydrosystems Lab., Urbana, Illinois* 61801 (NSG 7506)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0022, LAND COVER MAPPING USING REMOTE SENSING IMAGERY

M.D. Ashley, University of Maine, Orono Campus, School of Forest Resources, McIntire Stennis Program, *302 Boardman Hall, Orono, Maine* 04473 (0074928; ME09614)

OBJECTIVE: Common forest cover, base data needs between forest resource managers and other natural resource managers in Maine at the private, state and federal levels will be identified and then remote sensing imagery and techniques will be evaluated to find which of these can be used to satisfy these common data needs.

APPROACH: The common forest land cover, base data needs will be identified through interviews with state, private and federal forestry personnel. After analyzing these interviews, a common compatible system of forest land cover codes will be developed. LANDSAT satellite, small-scale aircraft and conventional scale imagery will then be studied to find which of these can most accurately and efficiently provide the needed common cover data.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Maine

5.0023, SURFACE DRIFT CURRENTS IN THE OCEAN

J.J. Dudis, University of Maryland, Eastern Shore, Undergraduate School, *Princess Anne, Maryland* 21853 (NSG 6025)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0024, AIRBORNE MARINE FOG STUDY
R. Markson, Airborne Research Associates, *46 Kendal Common Rd., Weston, Massachusetts* 02193 (DN890075; N00019-78-C-0289)

To study micrometeorological processes and properties in the lower atmosphere as related to the propagation of electromagnetic energy. This knowledge is required to develop realistic atmospheric models for use in propagation codes.

A specially instrumented aircraft will be used to measure significant atmospheric properties in the lower atmosphere over the ocean and over inland desert terrain. Aerosols, turbulence, and water vapor are of prime interest.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0025, AERONOMICAL STUDIES OF PLANETARY ATMOSPHERES
M.B. McElroy, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Applied Science, *Cambridge Station, Cambridge, Massachusetts* 02138 (ATM78-09712)

Theoretical studies of chemical interactions in the atmosphere of the Earth and other planets will be carried out. The work includes analysis of data of the distribution of sodium near Jupiter; study of the influence of ionospheric nitric oxide on the chemistry of OH and O3 in the Martian atmosphere; and studies of the effects of clouds, diurnal variations, latitude and seasonal changes, and human inputs on the chemistry of CO, CH4, CH3Cl and other gases in the Earth's atmosphere.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0026, AIR PHOTO ANALYSIS OF PLANT SUCCESSION
C.E. Olson, University of Michigan, Ann Arbor Campus, School of Natural Resources, *Ann Arbor, Michigan* 48104 (0067795; MICY00041-F)

OBJECTIVE: Determine the accuracy of air photo detection of ecotonal change in natural vegetation systems, and identify the parameters affecting accuracy.

APPROACH: Analyze sequential aerial photography over a 35-year period and compare type mapping results with historical records from ground surveys.

PROGRESS: Work to date has been inconclusive. Redesign of the interpretation plan and modification of test site locations to obtain a greater diversity of cover types is in process.

SUPPORTED BY Michigan State Government

5.0027, FORMATION OF ATMOSPHERIC AEROSOLS
K.T. Whitby, University of Minnesota, Minneapolis Campus, School of Engineering, Dept. of Mech Engin, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (R803851-03; G625B-EA-08)

Aerosol size distributions have been measured in the St. Louis area as part of EPA's Project MISTT using aircraft and ground-based, self-contained mobile laboratories. The University of Minnesota's portion of the project included aerosol measurements aboard an aircraft and the operation of a mobile van on the ground under the plumes.

The past year was devoted primarily to data analysis, the development of new analysis techniques and reporting results of aerosol data obtained over the past several years in Project MISTT and the Roadway Aerosol Study.

During the coming year the Particle Technology Laboratory of the University of Minnesota will be measuring aerosol size distributions for EPA's Project STATE (Sulfur Transport and Transformation in the Environment) in Tennessee and for EPA's Project SCRUB in Alabama and Minnesota. The STATE Program is directed to describing reactions and atmospheric processes affecting plume behavior over time scales of 12-96 hours and distances out to 1000 km. By contrast the SCRUB program will provide an assessment of the transport and transformation occurring within a power plant plume with an SO2 scrubber out to distances of about 1000 km and travel times mostly less than 12 hours.

Resources will be provided to complete data analysis and report on Project MISTT and to participate in the planning of Project SCRUB and the subsequent data analysis. Other tasks include the measurement of gaseous and aerosol pollutants under and in plumes being characterized in Project STATE and development of an aerosol mobility chromatograph to determine molecular composition of sulfur-containing aerosols.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0028, COMPLEX AEROSOL NUCLEATION EXPERIMENT - ACPL-2
W.C. Kocmond, University of Nevada, System Office, Desert Research Inst., *Reno, Nevada* 89507 (NAS 8-33273)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0029, GEOSTATISTICS
R.K. Zeigler, U.S. Dept. of Energy, Los Alamos Scientific Lab., *P.O. Box 1663, Los Alamos, New Mexico* 87544 (00002164)

The Los Alamos Scientific Laboratory, in close cooperation with the Grand Junction Operations Office of DOE, will develop and apply statistical methods to the analysis of data collected by airborne instrumentation in the assessment of uranium ore deposits throughout the continental United States and Alaska.

SUPPORTED BY U.S. Dept. of Energy

5.0030, DYE LASER LIDAR SYSTEM FOR REMOTE MONITORING OF AIR POLLUTION PRODUCED BY STATIONARY SOURCES, AREA SOURCES, AND PRESENT IN AMBIENT CONDITIONS
S.A. Ahmed, City University of New York, City College, School of Engineering, Dept. of Electrical Engin, *Convent Ave. & 138th St., New York, New York* 10031 (R803109-03; G712B-BA-37)

A development program is proposed to define the working parameters for a practical lidar system for remote monitoring and tracking of specific air pollutants. The system is designed to be of particular use in the monitoring and tracking of molecular pollutants produced by stationary and area sources as well as for measuring ambient pollution conditions.

A multifrequency dye laser will be used to detect pollutants by measuring the differential absorption of atmospheric elastic backscatter on and off resonance absorption peaks. The proposed scheme therefore combines the sensitivity of resonance absorption measurements with range information to provide an accurate method of determining accurately pollutant concentration and its spatial distribution.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0031, ESTABLISH AND OPERATE A SPACECRAFT PLANETARY IMAGERY FACILITY (SPIF) AT CORNELL
J. Veverka, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Astronomy, *Ithaca, New York* 14850 (NSG 7498)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0032, FATE OF NOX AND TRANSPORT OF OXIDANT
C. Spicer, Battelle Memorial Inst., Columbus Laboratories, *505 King Ave., Columbus, Ohio* 43201 (68-02-2439; G603A-AJ-07)

The objective of this program is two-fold; to determine the distribution and relationships among atmospheric nitrogen compounds and to determine the propensity of air masses to generate and transport oxidant beyond urban areas.

To achieve these objectives, an experimental program was conducted in Los Angeles during the fall of 1976. During this

study period chemical and meteorological data were obtained from three instrumental ground stations and an instrumental twin-engine aircraft.

In 1977, a study was undertaken in the midwestern part of the US to investigate the effect of the presence and passage of high pressure system on O3 and NOx relationships. Similar measurements will be taken. These include PAN, O3, NO, NO2, CO, C1-C2, hydrocarbon, halocarbons, solar intensity, temperature, etc.

These studies will be continued in 1978 at northeast sites to sample urban plumes transported over ocean bodies. The results from this study will be compared to past studies to identify and evaluate the important mechanisms that are affecting the nitrogen oxides lifetimes in ambient air.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0033, STUDY OF BENEFITS LANDSAT DATA

D.E. Ray, Oklahoma State University, School of Agriculture, Dept. of Agricultural Economics, *Agriculture Hall, Stillwater, Oklahoma* 74075 (NAS 9-15692)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0034, INITIATION AND EVOLUTION OF SEVERE CONVECTIVE STORMS

J. McCarthy, University of Oklahoma, Norman Campus, School of Arts & Sciences, Dept. of Meteorology, *660 Parrington Oval, Room 101, Norman, Oklahoma* 73069 (ATM78-12401)

This award supports continuing research on severe convective storms that occur in the research environment of the National Severe Storms Laboratory. Analysis of data from 1974-1977 field programs is continuing with emphasis on determining triggering mechanisms of tornado storms and the structure of the tornado cyclone and the gust front.

The second phase of this research supports participation in Project SESAME (Severe Environmental Storms and Mesoscale Experiments), a multi-agency field experiment conducted in the Oklahoma area during spring 1979. A large array of special field instrumentation is committed to Project SESAME including five Doppler radars, several instrumented aircraft, a special radiosonde network and surface meteorological networks. Data from these systems are available to all participating scientists. Research support under this award centers around experiments involving two research aircraft, a twin engine aircraft operating in the lower troposphere and a jet aircraft operating in the mid-troposphere, both operating within the Doppler radar network. Two specific experiments are planned. One seeks to define the structure of the dryline, examining the relationship between disturbances in the middle troposphere and the boundary layer. The second investigates the mid-tropospheric mixing of environmental air into the thunderstorm and its role in producing downdrafts.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0035, SATELLITE DATA ASSIMILATION IN NUMERICAL FORECAST MODELS

Y.K. Sasaki, University of Oklahoma, Norman Campus, School of Engineering, Dept. of Meteorology, *660 Parrington Oval, Room 101, Norman, Oklahoma* 73069 (NAS 5-25375)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0036, LABORATORY MEASUREMENT OF ABSORPTION CROSS SECTIONS FOR HNO4 IN THE 200-400 NM WAVELENGTH RANGE

J.S. Nisbet, Pennsylvania State University, University Park Campus, Ionosphere Research Lab., *201 Shields Bldg., University Park, Pennsylvania* 16802 (ATM78-16832)

Processes that remove NOx from the stratosphere are important in catalytic destruction of ozone by nitrogen compounds because they lessen the effects of nitrogen pollutants on the ozone layer. The objective of this research is to determine the photodissociation cross section of HNO4 in the range 200-400 nm. HNO4 has been previously observed to be formed by reaction of HO2 with NO2 and to be chemically stable at stratospheric temperatures. This research will assess its stability under UV irradiation and, therefore, permit an evaluation of HNO4 as a sink for stratospheric NOx.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0037, GOES SATELLITE RESEARCH PROJECT, JUNIATA RIVER BASIN, PENNSYLVANIA

C.D. Kauffman, U.S. Dept. of the Interior, Geological Survey, Water Resources Division, *Harrisburg, Pennsylvania* 17104 (PA 76-075)

An automated hydrologic data collection-processing system is needed to provide users with processed data which is essentially real time and independent of manually collected data tapes.

To evaluate the Geostationary Operational Environmental Satellite (GOES) system, determine the reliability of the convertible data collection platform (CDCP) and associated hardware, and demonstrate usefulness of data processing through the system. In 1976 the project was expanded to include the evaluation of COMSAT General's satellite data collection service.

To install CDCP's on water level sensors at nine of 14 gaging stations currently being operated in the basin and attempt to manage the stations based on data coming through the GOES system. Develop viable analysis and processing techniques using GOES-collected data. In 1976, five sites were selected for the COMSAT demonstration. USGS agreed to provide water-level sensors and shelters while COMSAT agreed to install and operate all hardware beyond sensors. Both parties will participate in writing an evaluation report after a six-month field demonstration is completed.

Installation of the nine convertible data collection platforms has been completed. A CDCP workshop was held in Harrisburg 8/24-27/76. All platforms were returned to factory for modification, and subsequently reinstalled in the field. CDCP performance has been monitored almost daily. All five COMSAT platforms have been installed and data has been retrieved from Salisbury, Connecticut through portable TI terminal located in Pa. District office.

Evaluate the geostationary operational environmental satellite (GOES) system, determine the reliability of the convertible data collection platform (CDCP) and associated hardware, and demonstrate usefulness of data processing through the system. Receive COMSAT data regularly through Reston computer and evaluate COMSAT system.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0038, DYNAMICS OF GULF STREAM MEANDERS

D.R. Watts, University of Rhode Island, Graduate School of Oceanography, *Administration Bldg., Kingston, Rhode Island* 02881 (OCE78-09655)

This project will study the dynamics of the Gulf Stream as the Stream leaves the continental margin at Cape Hatteras and flows into deep water. In this region meanders develop and grow in an envelope increasing downstream. At present, both theoretical and observational inconsistencies exist regarding the structure and development of Gulf Stream meanders. This project involves specific tests to resolve these conflicts including analysis of a large set of existing temperature data, utilization of data produced concurrently from existing program (e.g., satellite infrared imagery), and collection of new data from an array of deep current meters and inverted echo sounders, instruments which are particularly well-suited for monitoring the position of the Gulf Stream.

SUPPORTED BY U.S. National Science Foundation, Div. of Ocean Sciences

5.0039, APPLICATION OF LANDSAT DATA IN SOUTH CAROLINA
J.M. Cooper, University of South Carolina, School of Science & Mathematics, Dept. of Mathematics Computer Science & Statistics, *Admin. Bldg., Room 115, Columbia, South Carolina* 29208 (NSG 7504)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0040, APPLICATION OF SATELLITE AND AIRCRAFT IMAGERY TO HYDROGEOLOGY
G.K. Moore, U.S. Dept. of the Interior, Geological Survey, Water Resources Division, *Mundt Federal Bldg., Sioux Falls, South Dakota* 57198 (CR 73-196)

Remote sensing has considerable potential for hydrologic studies, particularly in the visible, infrared, and microwave parts of the spectrum. It offers new information and new tools to the hydrologist and can reduce the field work necessary in conventional studies. Research, testing, and development are needed to obtain operational procedures, however.

(1) Conduct research on the applications of remote sensing to ground-water occurrence, surface drainage characteristics, and water color and turbidity. Develop application examples. (2) Develop enhancement and interpretation procedures for remote sensing imagery and digital data, using both manual and computer processing. (3) Train and consult with other hydrologists on feasibility tests and operational uses of remote sensing. (4) Originate, plan, and coordinate programs and projects in remote sensing.

(1) Analyze existing data for hydrologic information; develop procedures for information extraction. Evaluate effects of atmosphere and soil and vegetation cover. (2) Evaluate existing procedures for manual and digital processing. Determine need and utility of new procedures. (3) Conduct training courses and briefings. (4) Work with WRD, EROS, and NASA personnel to originate and coordinate remote sensing applications to hydrologic problems.

Talks, briefings, and training lectures were given at EROS Data Center, Nat. Space Techn. Labs, SD State Univ., Murray State Univ., and one WRD District. A formal paper was presented at the World Water Conference in Mar del Plata, Argentina. Work on the Yampa basin and Johnstown flood was completed and underway, respectively. Research on water color and turbidity was completed. Personnel from five Districts were given training in digital processing of LANDSAT data.

Conduct training courses in hydrologic remote sensing. Begin research on relationship of source areas to stream flows. Continue work on Johnstown flood. Prepare formal paper on water turbidity. Continue training in digital processing. Prepare lecture notes for training courses.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0041, SOLID-STATE PROBLEMS IN THE SOLAR SYSTEMS
R. Smoluchowski, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (NSG 7505)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0042, SATELLITE OBJECTIVE FORECASTING
D.R. Johnson, University of Wisconsin, Madison Campus, Graduate School, *500 Lincoln Dr., Madison, Wisconsin* 53706 (DF581920; F19628-78-C-0137)

AF function - weather observing, analysis and forecasting for military operations. Deficiency - lack of information to meet military weather support requirements. Objective - to develop automated techniques which utilize meteorological satellite data and where necessary, conventional data in the objective specification and forecasting of mesoscale weather features. How development contributes -successful development of these techniques will allow automated forecasts of weather conditions at many locations satisfying AWS requirements specified in AWS TN 3-76.

Objective techniques will be developed using both satellite and conventional data. Use will be made of interactive data display systems to assist in identifying features of the satellite imagery and conventional data analyses that have potential as predictors. Tests will be made to evaluate how well forecasts with satellite data alone compare with those using conventional data as well.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0043, A STUDY ON THE METEOROLOGICAL SIGNIFICANCE OF CLOUD TRACKED WINDS DURING DATA SYSTEMS TEST 5 AND 6
V.E. Suomi, University of Wisconsin, Madison Campus, Inst. for Environmental Studies, *Agriculture Hall, Madison, Wisconsin* 53706 (NAS 5-25377)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0044, DATA SYSTEMS TEST EVALUATION
D.R. Johnson, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Meteorology, *500 Lincoln Dr., Madison, Wisconsin* 53706 (NAS 5-25399)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

5.0045, STUDY OF THE IONOSPHERE USING TRANSMISSIONS FROM RADIATING SATELLITES
O.J. Cardus, Observatorio del Ebro, *Tortosa, Spain* (DF582460; AFOSR-78-3498)

AF function - radar/navigation. Deficiency - refraction and range errors. Objective - measure and predict ionospheric parameters causing deficiencies. How research contributes - results used to develop predictive models and corrective algorithms for radar and satellite navigation systems such as GPS/NAVSTAR.

VHF signals from appropriate satellites recorded and analyzed by grantee to yield long- and short-term TEC variation. Analyses and reduced data delivered to AFGL for inclusion into AFGL-developed models and algorithms for operational commands.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, QUANTITATION OF READAPTATION OF SELECTED PHYSIOLOGICAL VARIABLES FOLLOWING ENVIRONMENTAL PERTURBATION
D.C. Holley, California State University & Colleges, San Jose State University, Graduate School, *Washington Sq., San Jose, California* 95192 (NCA 2-675903)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

6.0002, THE INTERACTION OF METAL IONS AND NUCLEOTIDES - POSSIBLE MECHANISMS FOR THE ADSORPTION OF NUCLEOTIDES ON HOMOINIC BENTONITE CLAYS
G.H. Loew, Stanford University, School of Medicine, Dept. of Genetics, *Stanford, California* 94305 (NCA 2-745902)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

6.0003, DUMMY AND HUMAN PARACHUTIST RESPONSE COMPARISONS

D. Goodrich, U.S. Dept. of Defense, Navy, National Parachute Test Range, *El Centro, California* 92243 (DN895414)

(1) To permit dummy test data to be used more knowledgeably in evaluating parachute with regard to human injury. (2) To better define and verify physiological tolerance limits during parachute opening. (3) To identify shortcomings in existing instrumented dummies, and to specify critical requirements to be addressed in developing improved dummies to evaluate human injury potential during parachute opening.

Parachute opening tests will be conducted using anthropomorphic dummies instrumented to obtain tri-axial linear acceleration and rotational rate data to compare with data accrued from live jumpers and with data from previous tests using similar dummies. Test conditions will be identical to the conditions used for separately funded concurrent live human subject tests. Analyses will be performed to identify the response differences between existing dummies and live subjects, and to develop a method with which to determine the probability of exceeding given acceleration limits for given airspeed ranges and parachute configurations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

6.0004, IN-FLIGHT EVALUATION STUDY OF GRAVITY IN MAN

Unknown, University of California, San Diego Campus, Graduate School, *P.O. Box 109, La Jolla, California* 92037 (NSG 9075)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

6.0005, STUDIES ON THE MUSCLE PEPTIDASES AND MYOSIN PROPERTIES AFTER FREEZE-INJURY, CROSS-REINNERVATION, IMMOBILIZATION AND THYROID STATUS

D.A. Riley, University of California, San Francisco Campus, School of Medicine, Dept. of Anatomy, *551 Parnassus Ave., San Francisco, California* 94122 (NCA 2-665901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

6.0006, EXPLORATION OF THE RELATIONS BETWEEN EYE COLOR, SELECTED PHYSIOLOGICAL MEASURES AND INDIVIDUAL NOISE SUSCEPTIBILITY

N.G. Hoger, U.S. Dept. of Defense, Navy, Naval Aerospace Medical Research Lab., *Pensacola, Florida* 32512 (DN877532)

To explore the relations between eye color, selected physiological measures and individual noise susceptibility. Identification of any such relationships would have implications toward the prevention of noise-induced hearing loss among naval personnel working in potentially hazardous noise environments.

Examine the extensive audiometric data obtained from subjects in the thousand aviator study and subjects in the control group of the repatriated prisoner of war (RPW) study. From the records of those subjects exhibiting hearing levels of 50 db or greater at 3000, 4000 or 6000 hz (subject group I) and those subjects exhibiting hearing levels of 25 db or less at 500 through 6000 hz (subject group II), determine eye color, percent body fat, systolic and diastolic blood pressures (sitting and supine), serum uric acid, cholesterol, and triglycerides. Conduct appropriate statistical analyses to determine possible relations between individual noise susceptibility, eye color and the various physiological measures. If findings warrant, develop a research plan to conduct selected tests on those subjects returning to Pensacola for medical follow-up as part of the thousand aviator and RPW/control group studies.

SUPPORTED BY U.S. Dept. of Defense, Naval Medical Research & Development Command, National Naval Medical Center

6.0007, COMPUTER-BASED INTERACTIVE FLIGHT TRAINING

W. Feurzeig, Bolt Beranek & Newman Inc., *50 Moulton St., Cambridge, Massachusetts* 02138 (DF052190; F49620-78-C-0066)

AF function - this research impacts future af aircrew training programs. Deficiency - continued flying hour curtailments and projected restrictions on aircrew training as we know it today require the development of innovative training technologies for the future. Better performance measurement algorithms are needed and more optimal use of computer-based training for transition and continuation training programs in flight simulators is required. Objective - this research will investigate computer implemented algorithms as a new approach to flight performance analyses expressly designed for interactive application in computer-based simulators. How research contributes -more effective aircrew training in flight simulation devices should occur as a result of this research.

This research employs state-of-the-art semantic representation and pattern recognition methods for extracting significant features of task performance by the aircrew member. Knowledge of the methods used by expert instructors in analyzing task performance and malperformance behaviors will be used in procedures for parsing flights, defining segments and transitions, recognizing and characterizing errors and error patterns, diagnosing underlying trainee difficulties, and prescribing remedial training tasks to overcome task difficulties. The Orly simulator will be used for data collection from expert instructors. Instructor models will be created to determine ways of generating diagnostic and prescriptive procedures for the trainee.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0008, ANALYSIS OF INTERACTION OF AGE, SEX, AND BED REST DECONDITIONING ON CARDIOVASCULAR PARAMETERS AND PREDICTIVE INDICES

R. Yuster, City University of New York, Queensborough Community College, Undergraduate School, Dept. of Electrical Technology, *56th & Springfield Aves., Bayside, New York* 11364 (NCA 2-625902)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

6.0009, INSTRUCTOR/OPERATOR STATION DISPLAY SYNTHESIS STUDY

N.D. Geddes, Systems Research Lab. Inc., *500 Woods Dr., Dayton, Ohio* 45432 (DF228590; F33615-78-C-0017)

To develop and apply methods and guidelines for synthesizing instructor/operator station (IOS) displays for flight simulators. The purposes is to devise an optimized method for producing display designs based on known or theorized limitations and other characteristics of the user's ability to perceive, integrate and utilize data from several different inputs simultaneously.

A design methodology will be developed for synthesizing IOS displays. The types of information to be displayed, as well as alternative ways of displaying it, will be identified and categorized. user limitations and other characteristics will be identified and used to develop a defendable set of guidelines for use in designing IOS displays. From these guidelines, a theoretically optimum IOS display design method will be developed and tested on two (2) sample IOS display synthesis problems. The resulting method will be used to develop advanced IOS displays.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0010, VECTOROCULOGRAPHY - MATHEMATICAL LEAD VECTOR IMPROVEMENT FOR THE ELECTROCULOGRAM
S. Dubin, Drexel University, School of Science, Dept. of Biological Science, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (NSG 7494)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

6.0011, EVALUATION AND MODELING OF THE CARDIOVASCULAR RESPONSE TO LOWER BODY NEGATIVE PRESSURE (LBNP)
M.F. Aburdene, Swarthmore College, Graduate School, Dept. of Engineering, *Swarthmore, Pennsylvania* 19081 (NCA 2-769901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

6.0012, RELATIVE TOXICITY TESTING OF SPACECRAFT MATERIALS
J. Autian, University of Tennessee, Center for the Health Sciences, School of Pharmacy, Dept. of Molecular Biology, *874 Union Ave., Memphis, Tennessee* 38103 (NAS 9-15670)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

6.0013, TECHNIQUES FOR ASSESSING G-RELATED PATHOLOGY IN PILOTS OF HIGH-PERFORMANCE AIRCRAFT
E.B. Smith, Technology Inc., *Houston, Texas* (DF323760; F33615-78-C-0614)

The myocardial infarctions that go unrecognized each year in the general population and the cardiomyopathy and subendocardial hemorrhage detected recently in swine exposed to acceleration stress make it imperative to develop a diagnostic tool to detect this damage if it exists in aircrews of high-performance aircraft. An analytical biochemical technique that correlates with myocardial injury will be developed.

The experimental protocol of this task is divided into four parts: (1) select the most appropriate analytical method for serum creatine phosphokinase isoenzymes and other chemical indicators to validate myocardial injury, (2) correlate laboratory induced myocardial injury with these selected chemical indicators, (3) correlate myocardial damage resulting from plus gz acceleration stress as in part 2, and (4) compare changes in isoenzymes concentrations in human subjects exposed to plus gz acceleration.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0014, DETECTION AND MEASUREMENT OF ALIPHATIC DIISOCYANATES
A.J. Roberts, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF324170)

Air Force personnel involved in aircraft painting are exposed to potentially hazardous concentrations of toxic chemicals in the working atmosphere. This effort will develop analytical methods/instrumentation to monitor aliphatic diisocyanate compounds used in polyurethane aircraft coatings as well as in AF packaging operations. This research supports an operational requirement of the Air Force Occupational and Environmental Health Laboratory (OEHL)

Concentrations of isocyanate compounds in air will be determined using high-speed liquid chromatography (HSLC) with ultraviolet detection. The sensitivity, accuracy and precision of the HSLC will be determined for stable urea derivatives of both aliphatic and cycloaliphatic isocyanates, and this methodology transitioned to the OEHL in September 1979.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0015, MULTIWIRE TECHNICAL MEDICAL APPLICATION
Unknown, University of Houston, Graduate School, *3801 Cullen Blvd., Houston, Texas* 77004 (NAS 9-15767)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, EFFECTIVE BEHAVIOR OF COMPOSITE MATERIALS
G.C. Papanicolaou, New York University, School of Arts & Sciences, Dept. of Mathematics, *421 1st Ave., New York, New York* 10012 (DF053040; AFOSR-78-3668)

AF function - aerospace vehicle design. Deficiency - design techniques for fastening composite materials. Objective - improved understanding of edge effects in composites. How work contributes -cracking and separation of laminates is influenced by stresses due to edge effects.

Asymptotic techniques including multispace and averaging have been used to obtain macroscopic equations for media with periodic fine structure like composites valid sufficiently far from edges. It is proposed to extend this work to areas including edge effects, irregular structure with associated fluctuation equations, and humidity transport and associated swelling as for example in epoxy.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0002, COMPUTER-AIDED GEOMETRIC DESIGN
R.E. Barnhill, Utah Higher Education System, University of Utah, School of Letters & Science, Dept. of Mathematics, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (MCS78-01966)

Computer-Aided Geometric Design (CAGD) is the effective computer representation of curves and surfaces. CAGD enables one to quantify mathematically and then to design interactively free-form curves and sculptured surfaces. Applications include the design of surfaces of airplanes, automobiles, ships, and the finite element analysis of these surfaces. Additional applications include the display of the surface of the human heart and of the earth. Computer graphics is integral to this research. The underlying mathematics for surfaces are variations of Coons patches for rectangles and triangles and of Shepard's Formula for arbitrarily spaced data. For curves, B-splines are used. Geometric handles for surface manipulation from a data tablet have been devised. This graphical software is necessary for real-time surface recomputation. This research is a combination of mathematical and computer software, requiring research contributions from Mathematics and Computer Science.

This is a continuation of grant MCS-7413017 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Mathematical & Computer Sciences

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, IONOSPHERIC DISTURBANCES - F-REGION AND D-REGION AIRGLOW RADAR STUDIES
F.A. Herrero, University of Puerto Rico, Rio Piedras Campus, School of Natural Sciences, Dept. of Physics, *Rio Piedras, Puerto Rico* 00931 (RIM78-16612)

This grant provides funds to pursue a detailed study of several ionospheric events which regularly occur and/or

propagate in the f and d regions (respectively near 250 km and 90 km). The spatial distribution and time dependence of these events will be measured with airglow instrumentation (interference filter photometer, spectrometer and Fabry-Perot interferometer) and radar techniques (Arecibo 1000-ft. dish and ionosonde) in order to learn more about the origin of these events and to study the response of the upper atmosphere to tidal perturbations, geomagnetic storms, and disturbances of tropospheric origin which propagate into the ionosphere.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

8.0002, DIRECT OBSERVATION OF INTERFACE INSTABILITY DURING CRYSTAL GROWTH

W.A. Tiller, Stanford University, School of Law, Dept. of Materials Science & Engineering, *Stanford, California* 94305 (NAS 8-33109)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

8.0003, PLASMA THEORY AND SIMULATION

C.K. Birdsall, University of California, Berkeley Campus, Electronics Research Lab., *Berkeley, California* 94720

Plasma physics is being done by many-particle computer simulation. Thousands of electrons and ions are followed in space and time in their own and applied electric and magnetic fields. Detailed information is obtained about the linear and nonlinear behavior of plasma oscillations, waves, instabilities, heating, and diffusion. The results are applied primarily to plasmas suitable for fusion power machines. The simulation effort is complemented by theory and analysis and other computation such as solution of dispersion relations; in addition, simulation methods are being analyzed and improved. Present projects include: (1) cross-field diffusion of electrons in presence of a (drift) wave; (2) ring-plasma instability, in a two-ion component plasma (D beam incident on T target); (3) quasilinear transport in a mirror machine (including radial dependence); (4) development of hybrid (particles plus fluids) simulation methods; (5) plasma simulation handbook; (6) completion of prototype mini-users center, connected to the MFE National Computer Center at LLL.

BIBLIOGRAPHIC REFERENCES: Harry E. Mynick, M.J. Gerver, and C.K. Birdsall, Stability Regions and Growth Rates for a Two-Ion Component Plasma, Unmagnetized, Phys. Fl., 20, April 1977, pp. 606-612; M.J. Gerver, C.K. Birdsall, A.B. Langdon, and D. Fuss, Normal Modes of a Loss Cone Plasma Slab with Steep Density Gradient, Physics of Fluids, 20, pp. 291-300, February 1977.

SUPPORTED BY U.S. Dept. of Energy

8.0004, RARE GASES IN INDIVIDUAL METEORITE GRAINS

J.H. Reynolds, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (INT78-00635)

Funds from this award will make possible a nine-month cooperative research effort beginning in September, 1978, on problems in meteoritics and rare gas analysis techniques between the American principal investigator and Dr. Peter M. Jeffery of the Physics Department of the University of Western Australia.

The investigator will work specifically on the development of miniaturized techniques for studying the rare gas contents of mineral grains separated from meteorites. These techniques will then be used to conduct a critical examination of the iodine-xenon dating method and to search for isotopically anomalous rare gases trapped in carbonaceous meteorites.

Using various approaches in a small vacuum system directly appended to a statically operated mass spectrometer, the investigators hope to make meaningful xenon measurements on small samples of separated mineral grains in order to facilitate answering several important questions about the I-Xe dating method. Without answers to these questions, further substantial progress in using the I-Xe method for studying the chronology of the early solar system will be impeded.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

8.0005, LABORATORY STUDIES OF SPACE PLASMA-RELATED PHENOMENA

R.L. Stenzel, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (ATM7718736A01)

This grant will start a new effort at merging laboratory plasma physics and space science. The Principal Investigators will perform a second generation of laboratory experiments in large plasma devices in a parameter regime scaled to the earth's magnetosphere. The goal is to test experimentally various theories of important space plasma physics problems. By establishing an interdisciplinary collaboration between laboratory plasma physics, theoretical plasma physics, computer simulations, space science and astrophysics, there is every expectation of significant progress.

Earlier attempts to perform laboratory experiments on space plasma physics problems were of limited success due to a lack of a suitable large laboratory plasma. The first-generation experiments suffered from undesirable boundary effects, which do not exist in space.

With this grant, second generation experiments will be performed in the large plasma device at UCLA. Specific objectives are to understand magnetic field reconnection and nonlinear Whistler wave phenomena.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

8.0006, X-RAY EMISSION, ELECTRON ACCELERATION, AND RELATED FLARE PROBLEMS

D.F. Smith, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NSG 7507)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

8.0007, STUDIES OF DEEP LEVEL IMPURITIES AND DEFECTS IN SEMICONDUCTORS

B.G. Streetman, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Coordinated Science Lab, *2527 Hydrosystems Lab., Urbana, Illinois* 61801 (DAAB-07-72-C-0259)

The study of deep level impurities and defects in semiconductors is a fundamental problem of solid-state physics, with important technological implications. For example, radiative and nonradiative recombination centers are crucial in the operation and reliability of various semiconductor devices. Defects produced during materials preparation and device fabrication often determine the operating characteristics and the useful lifetime of devices. In addition, certain deep-level impurities are required to promote luminescence, optical detection, or fast switching times in various devices. In this work we use low-temperature photoluminescence and optical absorption, Raman spectroscopy, deep level transient spectroscopy (DLTS), and electrical measurements to study deep levels. Materials studied include Si, GaAs, GaP, Ga(As,P), and (Al,Ga)As.

SUPPORTED BY U.S. Dept. of Defense, Army

8.0008, SYNCHROTRON RADIATION STUDIES OF IMPURITIES INTERACTING WITH METALS

C.P. Flynn, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois* 61801 (DMR77-27942)

A dual beam differential absorption apparatus will be built to make efficient use of large photon fluxes available from synchrotron storage rings in the study of the properties of materials. Initial research applications of the new equipment will be concerned with impurities interacting with metals. Impurities in metals, on metal surfaces, and at interfaces between two materials will be investigated. The photon absorption will reveal

phenomena associated with chemical shifts of core levels, crystal field splitting of atomic states in the material, and the response of the electron liquid to the excited center. These areas have strong relevance to alloy properties, chemical catalysis by material surfaces and to adhesion phenomena.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0009, RADIATION DAMAGE IN SOLIDS

J.S. Koehler, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois* 61801 (EY-76-C-02-1198)

We are irradiating pure metals and semiconductors with MeV electrons at low temperatures (down to 0.5 K). The damage production and the subsequent thermal annealing are studied by measuring changes in anomalous x-ray transmission and changes in electrical resistance. We are attempting to determine the geometrical structure and the properties of interstitials, lattice vacancies, and of various clusters of defects in these materials.

SUPPORTED BY U.S. Dept. of Energy, Div. of Basic Energy Sciences

8.0010, ATOMIC EMISSION SPECTROSCOPY

K.L. Andrew, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (PHY77-02087 A01)

Theoretical and experimental investigations of relatively simple spectra, are selected to shed the most light on the relationship between Slater-Condon theory and experimental data. Fourier spectroscopic techniques developed originally for molecules are being applied to atomic spectra.

This work is a continuation of that currently supported under NSF grant Number PHY75-09066A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0011, SPECIFIC HEAT AND ELECTRICAL PROPERTIES OF THE VANADIUM-TITANIUM MIXED OXIDES AT LOW TEMPERATURES

P.H. Keesom, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR76-80551)

Structural, thermodynamic, and electrical transport properties (including resistivity, thermoelectric power, heat capacity, magnetic susceptibility, and tunneling) of the single crystal alloys (TixV1-x)2O3 are being studied between 300 K and nearly 0 K. For 0 x 0.055 these crystals undergo a semiconductor to metal transition in the temperature range from 170 K to 0 K. It is expected that this study will contribute to the understanding of this transition.

When x equals 0.055 these transition metal oxides are metallic. They and their mirror image (VxTi1-x)2O3 show properties very similar to that of the noble metal spin glasses, e.g., AuFe or CuMn. All these systems show a very large term, linear in temperature, in the specific heat. The metallic (TixV1-x)2O3 exhibits a minimum in the resistivity while (VxTi1-x)2O3 exhibits a cusp in the susceptibility; both phenomena are found also in the noble metal spin glasses. The cusp in the susceptibility and the absence of any anomaly in the specific heat of the noble metal spin glasses is not understood; it should therefore be of help to investigate crystalline systems which show similar behavior. The investigation of the metallic transition metal oxides is also of intrinsic value as it will provide information on their semiconductor to metal transition and on their higher temperature properties. Of particular interest is the manner in which the temperature and heats of the semiconductor-metal transition in (TixV1-x)2O3 approach zero as x passes the critical value of x equals 0.0555.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0012, MOLECULAR BEAM EPITAXY FOR TERNARY SEMICONDUCTOR DEVICES

A.H. Clark, University of Maine, Orono Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *36 Winslow Hall, Orono, Maine* 04473 (ENG76-14393 A02)

This program is concerned with the use of molecular beam epitaxy (MBE) for fabrication of ternary semiconductor devices. Initial efforts are on films of CuInSe2 on bulk substrates of the same material. Continuing efforts will concentrate on: (1) production of materials and devices by homo-epitaxy of CuInSe2 and CuInTe2, (2) hetero-epitaxy of CuInSe2 on CdS, and (3) controlled growth of poly-crystalline CuInSe2 and CuInTe2 on various substrates.

Films are characterized in situ using electron diffraction and Auger analysis. In addition, resistivity, Hall effect, photoconductivity, optical constants, and photoluminescence are studied on materials and devices produced by MBE system.

This is a continuation of research previously supported under NSF grant ENG-7614393.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

8.0013, NEW METHOD FOR INFRARED DETECTION

J. Weber, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics, *College Park, Maryland* 20742 (ENG77-28458)

A new method for detection of electromagnetic radiation in the far infrared portion of the spectrum is being investigated. Free electrons in the surface layers of a conductor are employed to coherently scatter infrared photons into the microwave region. The requirements for conservation of energy and momentum require the scattering to take place in a magnetic field inside of a superconducting shield at cryogenic temperatures. The new approach is promising for the wavelengths region from 1 millimeter to 100 microns. Detectors based upon this principle would prove useful in radio astronomy and communications.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

8.0014, INVESTIGATION OF THE REDUCTION OF HIGH-DENSITY UNIFORM PLASMAS

D.H. Douglashamilton, Avco Corp., *2385 Revere Beach Pkwy., Everett, Massachusetts* 02149 (DF462510; F33615-78-C-2013)

Development of appropriate theories for predicting electron impact excitations of excited atoms and molecules. Calculation of electron impact cross sections from metastable states for selected atomic and molecular gases. This research directly contributes to the Air Force requirement for high-power coherent and incoherent light sources. Cross sections are not well known for indirect excitations from excited or metastable states. In order to correctly model and control the light source, electron impact cross sections must be known. Evidence exists that indirect excitations play a very important role in determining the energy balance in gas discharge lasers. This research is of immediate interest in furthering the development of coherent light sources.

The multichannel Eikonal treatment will be applied to the excitation processes while the Born approximation will be applied initially to the ionization processes. The binary encounter method will be modified so as to treat ionization of molecules. Also, the Eikonal approximation will be generalized and applied to ionization. Moreover, certain developments in the theory of ionization will be required so as to provide a description of ionization more accurate than the various theories that are at present available and to derive therefrom relative excitation and ionization probabilities from metastable excited states. The functions to be calculated shall be in the order of priorities listed or as coordinated with the technical monitor. The theoretical methods from atoms and from molecules shall be studied in parallel rather than sequentially.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

8.0015, TESTS OF THEORIES OF GRAVITATION
G.H. Pettengill, Massachusetts Inst. of Technology, School of Science, Dept. of Earth & Planetary Sciences, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (PHY78-07760)

Research in solar system observations about gravitational physics supported under NSF grant PHY72-05104 A05 will continue. Among the topics to be investigated are: 1) Perihelion advance of planetary orbits; 2) Principle of equivalence; 3) Test of possible time dependence of the gravitational constant; 4) Model of solar system. 1) planetary topography; 2) orbit of Jupiter; 3) asteroids.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0016, THEORETICAL STUDIES OF THE QUANTUM LIQUIDS AND SOLIDS
R.A. Guyer, University of Massachusetts, Amherst Campus, School of Arts & Sciences, Dept. of Physics, *Amherst, Massachusetts* 01002 (DMR76-14447 A01)

Work begun under NSF grant DMR76-14447 will be continued and extended. Theoretical studies of quantum solids and fluids will be undertaken with special emphasis on helium-3 and helium-4. Magnetism in solid helium-3 will be investigated using the Heisenberg field approximation to calculate the magnetic and thermal properties. The current data base for solid helium-3 is not self-consistent at present and the source of this discrepancy will be sought. In another area, diffusion of the two-dimensional lattice gas for both helium-3 and helium-4 will be studied for comparison with experimental studies of monolayers adsorbed on grafoil. Problems of registry, vacancy tunneling, and phase transitions in monolayer systems will be investigated. A new area of research in the study of solitons and non-linear effects in quantum systems will be undertaken.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0017, HIGH-ENERGY INTERACTIONS
G.A. Smith, Michigan State University, School of Natural Sciences, Dept. of Physics, *243 Natural Resources Bldg., East Lansing, Michigan* 48824 (PHY7828071)

This award will support a program in experimental elementary particle physics. The program will study the strong interactions in a number of experiments to be performed over the three-year period of the award. This will include experiments done in the bubble chamber to study very high-energy interactions of various hadron beams with hydrogen and heavy nuclei, to search for * in intermediate-energy K p interactions and to study intermediate-energy anti-proton annihilations.

In addition they will perform a counter-spark chamber experiment to search for radiative transitions in proton-anti-proton annihilations at rest.

This is the first year of a three-year continuing grant, previously supported under NSF grant PHY-25664, with Drs. Gerald A. Smith and Maris A. Abolins as co-principal investigators.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0018, MONOLAYER FILMS ADSORBED ON HIGHLY UNIFORM, WELL-ALIGNED GRAPHITE SUBSTRATES
M. Bretz, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Physics, *Ann Arbor, Michigan* 48104 (DMR76-20369 A01)

Research begun under NSF grant No. DMR76-20369 will be continued and extended. Monolayer films physisorbed on highly uniform, well-aligned graphite substrates will be studied with special emphasis on phase transitions and the effects of substrate bonding. Grafoil and UCAR-ZYX graphite will be used as substrates. Heat capacity measurements will be made for low-coverage helium monolayers to follow liquefaction into regions not previously accessible. Multilayer heat capacity measurements will be made on ZYX graphite to check capillary and geometry effects. A comparative study of mass flow, third sound, and persistent currents will be made. As time and resources permit, an AC heat capacity measurement on a cleaved single-crystal graphite surface will be undertaken.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0019, EXCITATION OF METASTABLE ATOMIC HYDROGEN BY LOW-ENERGY ELECTRONS
J.C. Zorn, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Physics, *Ann Arbor, Michigan* 48104 (PHY77-18832)

This grant initiates an experiment in atomic physics to measure the differential cross section for excitation of a particular excited state (the 2 2 S 1/2 state) of atomic hydrogen by impact of low-energy electrons. The cross section for this fundamental collision process has been calculated many times in a variety of approximations, but there is no data on the differential cross section in the interesting energy range of 0-1.4 eV above threshold. The time-of-flight experiment used here is particularly well suited for cross section measurements in the near-threshold regime. It avoids the electron optics problems inherent in conventional cross section determinations, and it provides values of the cross section over the complete range of 0-180 degrees.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0020, MICROSCOPIC THEORY OF QUANTUM FLUIDS AND EXTENDED NUCLEAR SYSTEMS
J.W. Clark, Washington University, School of Arts & Sciences, Dept. of Physics, *4559 Scott Ave., St. Louis, Missouri* 63130 (DMR78-08552)

Research previously supported by DMR76-14929.

Theoretical research in condensed matter and nuclear physics will be carried out. The emphasis will be on the microscopic theory of dense quantum systems, with application to liquid helium, nuclear structure and astrophysics. The specific projects to be undertaken include: (1) the evaluation of the one- and two-body density matrices of quantum fluids, (2) the development of hypernetted-chain methods for the calculation of distribution functions, (3) the application of the method of correlated basis functions to the ground states of liquid helium-three and nuclear matter, (4) investigations of non-uniform phases of extended nuclear systems, and (5) the calculation of the low states of the closed-shell nucleus, oxygen-16, in a correlated subspace.

The main thrust of this research is the development of the method of correlated basis functions, which is an accurate technique for calculating ground state properties of interacting particles. This will lead to an enhanced understanding of the behavior of realistic systems at the microscopic level.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0021, ZT-S IS THE SECOND GENERATION, MAGNETIC CONFINEMENT OF HIGH BETA PLASMA IN A TOROIDAL GEOMETRY BY THE METHOD OF REVERSED FIELD PINCH
D.R. Baker, U.S. Dept. of Energy, Los Alamos Scientific Lab., *P.O. Box 1663, Los Alamos, New Mexico* 87544

ZT-S is the second generation of the ZT series of toroidal reversed field pilnch (RFP) experiments at LASL. The general objective of the RFP program is to determine the feasibility of using the RFP configuration, with its theoretically predicted MHD stability for a fusion reactor. The concept offers the potential of leading to an economic fusion reactor of moderate size, having high ohmic heating rates, and arbitrary toroidal aspect ratio which greatly eases the construction and maintenance as well as offering a possible escape from trapped particle instabilities. ZT-S utilizes a dielectric (alumina torus) with minor and major radii of 7.7 and 40 cm respectively. Toroidal field is 16 kG and toroidal current is between 60 and 80 kA. Basic plasma parameters are n approximately 1-8 x 10/sup 15/ cm/sup -3/, T/sub e/ approximately 15 eV, T/sub i/ approximately 30 eV, and beta approximately equal to 0.4. The confinement time of about

40 microseconds obtained on ZT-S represents a demonstration of s/sup 2/ scaling of confinement time in RFP devices.

SUPPORTED BY U.S. Dept. of Energy, Div. of Magnetic Fusion Energy

8.0022, ELECTRONIC STRUCTURE OF CRYSTALS AND ALLOYS

B.S. Segall, Case Western Reserve University, Graduate School, Dept. of Physics, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (DMR76-21550 A01)

Research previously supported by DMR76-21550.

Theoretical condensed matter research will be carried out. The main areas of research will be the calculation of the electronic structure and some associated (e.g., optical and x-ray) properties of pure metals crystals and random alloys. Accurate electronic structure and useful wave functions will be obtained by the Chen-Segall parameterization scheme which utilizes a few pieces of empirical data. The coherent potential approximation approach will be implemented for the study of random alloys. The first alloys to be studied will be those of the CuAu and CuZn systems. It is also planned to study the ordered Cu3Au and Beta prime CuZn phases of these systems. X-ray spectra of the alloys will be obtained. A study of the dependence of the surface electronic structure of one-dimensional semi-infinite crystals and films on the parameters of the problem (e.g., strengths and shapes of the 'atomic' and barrier potentials, film thickness) will be completed.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0023, ULTRASONIC STUDIES OF A15 AND C15 SUPERCONDUCTING COMPOUNDS

J.A. Rayne, Carnegie Mellon University, Mellon Inst. of Science, Dept. of Physics, *4400 5th Ave., Pittsburgh, Pennsylvania* 15213 (INT78-11294)

For eight months, beginning in January, 1979, the principal investigator will work with Australian colleagues T. Frederick Smith and Trevor R. Finlayson of Monash University on ultrasonic studies of superconductors. The data gathered using ultrasonic techniques will be compared with other kinds of data (e.g., x-ray, Mossbauer, etc.) to gain better understanding of the elastic properties of high-temperature superconducting compounds.

The investigators will measure specifically the acoustic properties of the A15 and C15 structural classes of superconducting compounds in the temperature range from 4.2 to 300 degrees Kelvin. Using frequencies in the MHz range, the researchers will initially study single crystal V3Ge, prepared by colleagues at Australian National University, as a function of composition in order to shed light upon the anomalous thermal expansion of this compound and its relationship to the kind of tetragonal-to-cubic structural distortion found in niobium-tin compounds. Subsequent measurements of such C15 compounds as V2Hf and V2Zr will be made to gain further insight into the nature of the transformation in these materials and the connection between lattice instabilities and transition temperatures.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

8.0024, FEASIBILITY STUDIES FOR LIGHT SCATTERING EXPERIMENTS IN SPACE TO DETERMINE THE VELOCITY RELAXATION OF SMALL PARTICLES IN A FLUID

C.A. Acquista, Drexel University, Graduate School, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (NSG 2357)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

8.0025, ATOM-PROBE AND FIELD ION MICROSCOPY

T.T. Tsong, Pennsylvania State University, University Park Campus, School of Science, Dept. of Physics, *211 Whitmore Lab., University Park, Pennsylvania* 16802 (DMR78-15925)

Experimental research utilizing atomic resolution of the field ion microscope (FIM) and the single atom sensitivity of the atom-probe FIM which previously was supported by NSF grant DMR-7611418 will be continued. The electronic and atomic properties of solid surfaces, particularly Group VIII and IB metals and dilute alloy surfaces, will be investigated. The composition depth profiles of binary alloys such as Fe-Cr, Pt-Cu, Pt-Au and Ni-Cu will be studied with the atom-probe with a single atomic layer resolution. The fundamental force law governing the interaction of two surface atoms will be investigated through the frequency distribution function of finding various bond lengths between two interacting atoms, the association-dissociation behavior of atomic clusters, the directional walk of single atoms with a driving force, and the displacement distribution function of atomic jumps. The kinetics and dynamics of the trapping of a terrace atom by an impurity atom or by lattice steps will be investigated in detail. We can derive not only quantitative data on atomic interaction, but also the dipole moment, the polarizability and the electronic density of states of surface atoms.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0026, INELASTIC ELECTRON SCATTERING FROM SURFACE ADSORBATES

E.W. Plummer, University of Pennsylvania, School of Arts & Sciences, Dept. of Physics, *34th & Spruce Sts., Philadelphia, Pennsylvania* 19104 (DMR78-08520)

This is an extension of research previously supported by NSF grant DMR-7302656 A01.

Vibrational modes of atoms and molecules on solid surfaces will be studied using high resolution inelastic electron scattering. The mechanisms for the scattering of low-energy electrons from adsorbed complexes will be investigated in an attempt to observe short range molecular scattering. In this scattering mode all of the fundamental modes of the surface complexes can be observed. The identification of the fundamental vibrational modes will enable one to identify the bonding configurations of a surface atom or molecule. This information is important in understanding bonding and reactions at solid surfaces.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0027, DEVELOPMENT OF THEORETICAL MOLECULAR MODELS FOR LINE POSITIONS AND STRENGTHS OF SEVERAL METHANE BANDS

K. Fox, University of Tennessee, Knoxville Campus, School of Liberal Arts, Dept. of Physics & Astronomy, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (NAS 5-25428)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

8.0028, COLLISIONS INVOLVING ATOMS IN HIGH RYDBERG STATES

R.F. Stebbings, Rice University, Graduate School, Dept. of Physics, *6100 Main St., Houston, Texas* 77001 (PHY78-09860)

Research will continue on the structure and properties of very highly excited ('Rydberg') atoms. Topics to be pursued include: 1. Thermal collisions with atoms and molecules; 2. Collisions with low-energy electrons; 3. Field ionization; 4. Production of Rydberg atoms; 5. Excitation transfer; 6. Chemiionization.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0029, ELEMENTARY PARTICLE THEORY

V.L. Teplitz, Virginia Polytechnic Inst. & State University, School of Arts & Sciences, Dept. of Physics, *Blacksburg, Virginia* 24061 (PHY78-08436)

The proposed work is in the field of theoretical physics, emphasizing study of the interactions among elementary particles. Specific problems to be examined include: a) Continuation

of the unitary pi N yields pi pi N isobar analysis; b) Extension of the results in A to pi N elastic scattering and pi pi N threshold (current algebra) analysis; c) study of M1 transitions using the MIT bag model; d) application of astrophysics to weak interaction phenomenology.

This work is a continuation of that currently supported under NSF grant PHY-7611349A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0030, COLLISIONAL EXCITATION AND RADIATION OF ATOMS AND MOLECULES

C.C. Lin, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Physics, *500 Lincoln Dr., Madison, Wisconsin* 53706 (DF052870; AFOSR-78-3649)

AF function - RO 3.2, Optical Effects in Communications, Surveillance, Navigation, and Detection Systems. Deficiency - any optical/infrared sensor system operating in or above the earth's atmosphere must look through or against the background of atmospheric radiation. Objective - this research will elucidate the role played by collisional effects in atmospheric processes that generate background radiation. Contribution - further understanding of electron-induced atmospheric processes and in particular those processes producing optical and infrared emissions.

Basic research will be conducted on inelastic collision of electrons or negative ions with atoms and molecules and on the subsequent radiation from those atoms and molecules.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, INVESTIGATION OF THE 1-0 QUADRUPOLE SPECTRUM OF HYDROGEN IN ASTRONOMICAL OBJECTS

J.E. Gaustad, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (AST78-06715)

A study of the 1-0 rotation-vibration band of molecular hydrogen (H2) in astronomical objects will be continued. The goals of this study are: 1. to study the radial velocity and profile of the S(1) line in known H2 sources in order to understand the dynamics of the emitting regions; 2. to search for H2 in other astronomical objects and to map its distribution in them; in particular to study the relation of H2O maser sources and H2 emission; 3. to measure the intensity of different quadrupole lines in order to study their excitation.

A Fabry-Perot spectrometer will be used for the observations.

This is a continuation of grant AST76-80198.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0002, GAMMA RAY OBSERVATORY MISSION - FINAL DEFINITION PHASE

Unknown, University of California, San Diego Campus, Graduate School, *P.O. Box 109, La Jolla, California* 92037 (NAS 5-25448)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

10.0003, MAPPING THE CHEMICAL PROPERTIES OF THE GALACTIC HALO BY PHOTOGRAPHIC AND PHOTOELECTRIC METHODS (ABBREV)

A. Sandage, Carnegie Insts of Washington, *1530 P St. N.W., Washington, District of Columbia* 20005 (AST78-00534)

A television guiding system will be installed on the 100 inch (2.5M) Mt. Wilson telescope of the Hale Observatories. The television system will store, integrate, and display the viewing field. The television system will allow remote operation of the telescope. The astronomer will not have to be located at the Newtonian or Cassegrain platform. The television guiding system will enable the astronomer to pick out the desired objects he wishes to observe and guide the telescope from a remote, convenient data room and thus the telescope will be used more efficiently.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0004, PHOTOMETRIC PERFORMANCE OF AIRBORNE INFRARED TELESCOPES

D.A. Harper, University of Chicago, School of Physical Sciences, Dept. of Astronomy & Astrophysics, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (NCA 2-108901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

10.0005, HIGH-RESOLUTION STUDIES OF ULTRAVIOLET LINES IN O-B STARS

L.W. Kamp, Boston University, School of Arts & Sciences, Dept. of Astronomy, *881 Commonwealth Ave., Boston, Massachusetts* 02215 (NAS 5-25445)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

10.0006, X-RAY OBSERVATIONS OF A COMPACT BINARY SOURCE

A.K. Dupree, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (NSG 5312)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

10.0007, STUDIES OF PECULIAR STELLAR SPECTRA

A.P. Cowley, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Astronomy, *Ann Arbor, Michigan* 48104 (AST78-15952)

The research to be conducted under this grant will be devoted to spectroscopic studies of stars. The objects to be studied will include stellar systems containing bright X-ray sources. There will be detailed investigations of optically identified stellar sources, and attempts will be made to find optical counterparts for unidentified X-ray sources. Very massive luminous stellar systems will be studied by means of high resolution spectroscopy. There will be particular emphasis on the brightest stars in the Magellanic Clouds. There will also be spectroscopic studies of red giant stars in clusters of stars in our own Galaxy and in star clusters in the Large Magellanic Cloud.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0008, RELOCATION AND OPERATION OF THE BURRELL SCHMIDT-TYPE TELESCOPE OF THE WARNER AND SWASEY OBSERVATORY

P. Pesch, Case Western Reserve University, Graduate School, Dept. of Astronomy, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (AST77-20515)

This project will provide funds for the relocation of the Burrell Telescope of the Warner and Swasey Observatory of Case Western Reserve University from Cleveland, Ohio, to Kitt Peak, Arizona. This 61/91 cm Schmidt-type telescope is the largest of its type in the United States that is equipped with objective prisms. Its past use for wide field studies of the region of our Galaxy near the sun has been very successful. The recent development of improved photographic plates now makes it possible to undertake much deeper objective prism surveys. The relocation of the telescope to a superior astronomical site will (1) provide

much improved observing conditions which will enable astronomers to utilize fully the capabilities of the telescope, and (2) make the telescope available (via the Kitt Peak National Observatory visitors' program) to the entire astronomical research community.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0009, INVESTIGATION OF THE TIDAL STRUCTURE OF THE THERMOSPHERE AND MESOSPHERE

R.M. Harper, Rice University, Graduate School, Dept. of Space Physics & Astronomy, *6100 Main St., Houston, Texas* 77001 (ATM7720240A01)

This grant funds an investigation of the Tidal Structure of the Thermosphere and Mesosphere based on a unique data base. It will study further atmospheric variations with periodicities of from a few days to a month, a range for which there is a serious lack of information. Some of the known periodicities attributed to this range are: a 2 day periodicity in the mesospheric winds at mid-latitudes detected by meteor radars, the mixed Rossby-gravity and Kelvin waves of the equatorial stratosphere (4-5 and 10-15 days, respectively), the magnetic activity (27 days) and the lunar tide (28 days).

The stratospheric data is to be analyzed in collaboration with Professor S. Kato's group from Kyoto University during an extended visit by Dr. Harper to Japan. The thermospheric data will be analyzed later at Rice University.

The objectives of the analysis include to: determine the dominant periods and vertical structures of the oscillations with periods greater than one day in the stratosphere, mesosphere and lower thermosphere; determine the low-latitude variation of neutral temperature and meridional wind associated with magnetic activity; and continue analysis of approximately 50 days of thermospheric data (gathered by Dr. Harper while at Arecibo) in order to better define the tidal oscillations of the thermosphere.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0010, EXPERIMENTAL MEASUREMENTS OF UNSTEADY TURBULENT BOUNDARY LAYERS NEAR SEPARATION

R.L. Simpson, Southern Methodist University, School of Engineering & Applied Sciences, Dept. of Electrical Engineering, *Hillcrest & University, Dallas, Texas* 75222 (NSG 2354)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

GENERAL

11.0001, SETUP AND OPERATION OF VIDICON DETECTOR SYSTEM

J. McCord, University of Hawaii System, Manoa Campus, Graduate School, *Spalding Hall, Room 359, Honolulu, Hawaii* 96822 (NAS 9-15784)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

11.0002, PROVIDE A PUBLIC INFORMATION PROGRAM

P. Layman, Virginia State Community College, Eastern Shore Community College, Undergraduate School, *Melfa, Virginia* 23410 (NAS 6-2964)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Org. & Management, Office of University Affairs

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01 AERONAUTICS (GENERAL)

N79-20987* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 107
Mar. 1979 128 p
(NASA-SP-7037(107)) Avail: NTIS HC E02 CSCL 01A

Reports, articles, and other documents introduced into the NASA scientific and technical information system in February 1979 are listed in this bibliography. S.E.S.

N79-20988*# Battelle Columbus Labs., Ohio.
APPLICATIONS OF A HIGH-ALTITUDE POWERED PLATFORM (HAPP) Final Report
M. B. Kuhner, R. W. Earhart, J. A. Madigan, and G. T. Ruck Sep. 1977 104 p refs
(Contract NASw-2800)
(NASA-CR-158466; BCL-OA-TFR-77-5) Avail: NTIS HC A06/MF A01 CSCL 02A

A list of potential uses for the (HAPP) and conceptual system designs for a small subset of the most promising applications were investigated. The method was to postulate a scenario for each application specifying a user, a set of system requirements and the most likely competitor among conventional aircraft and satellite systems. As part of the study of remote sensing applications, a parametric cost comparison was done between aircraft and HAPPS. For most remote sensing applications, aircraft can supply the same data as HAPPs at substantially lower cost. The critical parameters in determining the relative costs of the two systems are the sensor field of view and the required frequency of the observations being made. The HAPP is only competitive with an airplane when sensors having a very wide field of view are appropriate and when the phenomenon being observed must be viewed at least once per day. This eliminates the majority of remote sensing applications from any further consideration. M.M.M.

N79-20989*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
CORRELATION OF PREDICTED AND MEASURED THERMAL STRESSES ON AN ADVANCED AIRCRAFT STRUCTURE WITH SIMILAR MATERIALS
Jerald M. Jenkins Apr. 1979 40 p refs
(NASA-TM-72862; H-1086) Avail: NTIS HC A03/MF A01 CSCL 02A

A laboratory heating test simulating hypersonic heating was conducted on a heat-sink type structure to provide basic thermal stress measurements. Six NASTRAN models utilizing various combinations of bar, shear panel, membrane, and plate elements were used to develop calculated thermal stresses. Thermal stresses were also calculated using a beam model. For a given temperature distribution there was very little variation in NASTRAN calculated thermal stresses when element types were interchanged for a given grid system. Thermal stresses calculated for the beam model compared similarly to the values obtained for the NASTRAN models. Calculated thermal stresses compared generally well to laboratory measured thermal stresses. A discrepancy of signifiance occurred between the measured and predicted thermal stresses in the skin areas. A minor anomaly in the laboratory skin heating uniformity resulted in inadequate temperature input data for the structural models. A.R.H.

N79-20990# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
TRANSONIC AERODYNAMIC TESTING
Jan. 1972 383 p refs Lecture held at Rhode-Saint-Genese, Belgium, 17-21 Jan. 1972
(VKI-Lecture-Series-42) Avail: NTIS HC A17/MF A01

The following topics are discussed: (1) aircraft in transonic flight; (2) scale effect at transonic speeds; (3) transonic wind tunnels; (4) design and characteristics of high Reynolds number test facilities (Ludwieg Tube); (5) boundary layer effects on pressure variations in Ludwieg Tubes; (6) the design of wind tunnel models for tests at transonic speeds and high Reynolds numbers; (7) flight test techniques for a transonic aircraft; (8) experimental techniques for transonic testing in shock tubes; and (9) possibilities for scale effect on swept wings at high subsonic speeds. For individual titles, see N79-20991 through N79-20999.

N79-20991# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THE PROBLEM: AIRCRAFT IN TRANSONIC FLIGHT c05
B. H. Goethert *In its* Transonic Aerodyn. Testing Jan. 1972 40 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

Graphs representing the various aerodynamic characteristic data obtained through wind tunnel and flight testing of aircraft at transonic speeds are presented. G.Y.

N79-20992# National Aero- and Astronautical Research Inst., Amsterdam (Netherlands).
SCALE EFFECTS AT TRANSONIC SPEEDS BASIC CONSIDERATIONS c02
J. P. Hartzuiker *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 22 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

The aerodynamic phenomena on modern aircraft wings at transonic speeds are so complex that understanding them will rely on experiments for a long period to come. All problems discussed are mainly illustrated by means of two-dimensional airfoils. Except, maybe, for wings with large regions of separated flow where three-dimensional effects are certainly present, the analogy between two-dimensional flows and the flow over the important parts of swept wings appears to justify this approach. The following topics are discussed: (1) the flow over transonic airfoils; (2) shock wave boundary layer interactions; (3) pressure gradient separations; and (4) the type of pressure distribution in the supersonic region. G.Y.

N79-20993# ARO, Inc., Arnold Air Force Station, Tenn.
TRANSONIC WIND TUNNELS **c09**
Michael Pindzola *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 88 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

A short review of the evolution of transonic wind tunnels is presented. Those problem areas which prevent an exact duplication of free flight conditions in a transonic wind tunnel are analyzed. Wall interference in subsonic wind tunnels and wave reflections in supersonic wind tunnels are discussed. G.Y.

N79-20994*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DESIGN AND CHARACTERISTICS OF HIGH REYNOLDS NUMBER TEST FACILITIES: THE LUDWIG TUBE **c09**
A. R. Felix *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 38 p (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01 CSCL 14B

Graphs and data tables are presented for the design and characteristics of high Reynolds number test facilities (wind tunnels). G.Y.

N79-20995# Technische Hochschule, Darmstadt (West Germany).
BOUNDARY LAYER EFFECTS ON PRESSURE VARIATIONS IN LUDWIEG TUBES **c02**
Eckart Piltz *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 7 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

Ludwieg Tubes or Tube Wind Tunnels are rather simple gas dynamic testing facilities in which almost steady sub- and supersonic flow can be maintained for some period of time. Basic to the operation cycle of a Ludwieg Tube is an expansion wave which propagates down a cylindrical tube serving as gas storage. Soon after Ludwieg's suggestion for construction of such tubes, theoretical calculations were made to predict the boundary layer growth and the resulting variations of pressure and stagnation pressure as well as other thermodynamic properties of the tube flow. Experimental results are given to test the theory. In addition, it is shown how the original theory should be modified and/or simplified to give good agreement with experimental data. G.Y.

N79-20996# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.
THE DESIGN OF WIND TUNNEL MODELS FOR TESTS AT TRANSONIC SPEEDS AND HIGH REYNOLDS NUMBERS **c02**
C. R. Taylor *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 36 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

Two principle subjects are addressed; the limitations imposed by model design on the extent to which high tunnel pressures can be used to obtain higher model Reynolds numbers, and the matching of model and aircraft shapes. The discussion is confined to models of aircraft with swept wings of moderate to high aspect ratio. G.Y.

N79-20997# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
FLIGHT TEST TECHNIQUES FOR A TRANSONIC AIRCRAFT **c05**
J. M. Lewendon *In its* Transonic Aerodyn. Testing Jan. 1972 32 p (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

By popular definition a transonic aircraft is one which is incapable of supersonic speeds in level flight, but has to dive in order to attain speeds in excess of Mach 1.0. The majority of the flight tests made on a transonic aircraft are at subsonic conditions up to perhaps Mach .97, with opportunities to explore in brief periods the aircraft's characteristics when flying at speeds in excess of Mach 1.0. The test techniques described align themselves to this conclusion. G.Y.

N79-20998# Institute of Fluid Mechanics and Aerospatial Design, Bucharest (Rumania).
EXPERIMENTAL TECHNIQUES FOR TRANSONIC TESTING IN SHOCK TUBES **c09**
Lucian Z. Dumitrescu *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 43 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

Even in the early stages of its development, the shock tube was put to use for the study of transonic aerodynamic phenomena by the pioneers in the field. But very soon, the advent of large-scale test facilities, continuous or intermittent, relegated the shock-tube to other applications, of which the main aerodynamic one is the production of hypersonic high-enthalpy flows. However, the use of shock-tubes for generating transonic flows has some unique advantages, which will become apparent hereafter; these led to a program aimed at solving a number of problems in connection to this method. G.Y.

N79-20999# Aircraft Research Association Ltd., Bedford (England).
POSSIBILITIES FOR SCALE EFFECT ON SWEPT WINGS AT HIGH SUBSONIC SPEEDS. RECENT EVIDENCE FROM PRESSURE PLOTTING TESTS **c02**
A. B. Haines *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 34 p refs Also presented at AGARD Fluid Dyn. Panel Specialists' Meeting, Goettingen, West Ger., 26-28 Apr. 1971 (For primary document see N79-20990 12-01)
(Rept-18; Paper-14) Avail: NTIS HC A17/MF A01

The possibilities for scale effect on swept wings under supercritical flow conditions at high subsonic speeds are discussed on the basis of evidence from pressure plotting tests on a variety of wings. For the Super VC.10, comparison of pressure distributions measured in flight, and in model tests at R = 5,400,000 shows some scale effect but it is not dramatic, largely because there is no incipient rear separation tendency in the tunnel tests. For other designs however, the scale effect could be much greater; the paper shows that the underfixing technique has limitations when applied to a sweptback wing. Examples are included where the flow patterns are very complex with many interacting features. G.Y.

N79-21000*# United Technologies Research Center, East Hartford, Conn.
STUDY OF FUTURE WORLD MARKETS FOR AGRICULTURAL AIRCRAFT Progress Report, May 1978 - Feb. 1979
F. W. Gobetz and R. J. Assarabowski Apr. 1979 214 p refs (Contract NAS1-14795)
(NASA-CR-158937; R79-912839-24) Avail: NTIS HC A10/MF A01 CSCL 02A

The future world market for US-manufactured agricultural aircraft was studied and the technology needs for foreign markets were identified. Special emphasis was placed on the developing country market, but the developed countries and the communist group were also included in the forecasts. Aircraft needs were projected to the year 2000 by a method which accounted for field size, crop production, treated area, productivity, and attrition of the fleet. A special scenario involving a significant shift toward aerial fertilization was also considered. An operations analysis was conducted to compare the relative application costs of various existing and hypothetical future aircraft. A case study was made of Colombia as an example of a developing country in which aviation is emerging as an important industry. J.M.S.

N79-21001*# Aerophysics Research Corp., Bellevue, Wash.
NSEG: A SEGMENTED MISSION ANALYSIS PROGRAM FOR LOW AND HIGH SPEED AIRCRAFT. VOLUME 3: DEMONSTRATION PROBLEMS Final Report
D. S. Hague and H. L. Rozendaal Washington NASA Sep. 1977 181 p 3 Vol.
(Contract NAS1-13599)
(NASA-CR-2809) Avail: NTIS HC A09/MF A01 CSCL 02A

Program NSEG is a rapid mission analysis code based on the use of approximate flight path equations of motion. Equation form varies with the segment type, for example, accelerations, climbs, cruises, descents, and decelerations. Realistic and detailed

vehicle characteristics are specified in tabular form. In addition to its mission performance calculation capabilities, the code also contains extensive flight envelope performance mapping capabilities. For example, rate-of-climb, turn rates, and energy maneuverability parameter values may be mapped in the Mach-altitude plane. Approximate take off and landing analyses are also performed. At high speeds, centrifugal lift effects are accounted for. Extensive turbojet and ramjet engine scaling procedures are incorporated in the code. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N79-21002 Engineering Sciences Data Unit, London (England).
INTRODUCTION TO EQUATIONS OF MOTION FOR PERFORMANCE
1978 15 p
(ESDU-78038; ISBN-0-85679-242-X) For information on availability of series, subseries, or individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC E99

This item presents the equations of motion of rigid bodies and a number of associated relationships which may be used in both the prediction of, and analysis of measurements of, aircraft point performance. The equations are presented in general form with the nature of the forces and moments unspecified and the user should consult the appropriate Data items in the Sub-series for advice regarding the significant forces and moments to be considered in the solution of particular problems. The opportunity has been taken in this item to link the Performance Sub-series with the Terms and symbols for flight dynamics adopted by the international Organization for Standardization since this provides a comprehensive notation together with definitions and sign conventions for most axis systems, forces, moments, angles etc, which are likely to be used in performance work. ESDU

N79-21003 Pennsylvania State Univ., University Park.
SECONDARY-FLOW-RELATED VORTEX CAVITATION Ph.D. Thesis
Michael Leroy Billet 1978 200 p
Avail: Univ. Microfilms Order No. 7909045

A study is presented of a vortex formed near the inner wall of a rotor operating within a boundary layer. Experimental critical cavitation data and laser Doppler anemometer measurements obtained downstream of the rotor plane are given for many flow configurations. In addition, rotor inlet and outlet velocity profiles were measured. Experimental results show an influence of inlet velocity gradient near the inner wall on the critical cavitation number of the vortex. Secondary flow vorticity equations are developed and employed to calculate the vorticity in the blade passage near the inner wall of a rotor. The secondary vorticity induces an additional component of tangential velocity which was found to increase the flow turning near the inner wall. This increased tangential velocity profile compared favorably with the measured vortex profile outside of the vortex core region. Dissert. Abstr.

N79-21004*# Remtech, Inc., Huntsville, Ala.
AERODYNAMIC HEATING TO REPRESENTATIVE SRB AND ET PROTUBERANCES Final Report
Carl D. Engel and Judy K. Lapointe Feb. 1979 388 p refs
(Contract NAS8-32585)
(NASA-CR-161198; RTR-029-1) Avail: NTIS HC A17/MF A01 CSCL 01A

Heating data and data scaling methods which can be used on representative solid rocket booster and external tank (ET) protuberances are described. Topics covered include (1) ET geometry and heating points; (2) interference heating test data (51A); (3) heat transfer data from tests FH-15 and FH-16; (4) individual protuberance data; and (5) interference heating of paint data from test IH-42. A set of drawings of the ET moldline and protuberances is included. A.R.H.

N79-21005*# Ecodynamics Research Associates, Inc., Albuquerque, N. Mex.
SEMIDIRECT COMPUTATION OF THREE-DIMENSIONAL VISCOUS FLOWS OVER SUCTION HOLES IN LAMINAR FLOW CONTROL SURFACES Final Report
Patrick J. Roache Mar. 1979 23 p refs
(Contract NAS1-15045)
(NASA-CR-159017) Avail: NTIS HC A02/MF A01 CSCL 01A

A summary is given of the attempts made to apply semidirect methods to the calculation of three-dimensional viscous flows over suction holes in laminar flow control surfaces. The attempts were all unsuccessful, due to either (1) lack of resolution capability, (2) lack of computer efficiency, or (3) instability. Author

N79-21006*# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Mechanical and Industrial Engineering.
CALCULATIONS OF TRANSONIC BOATTAIL FLOW AT SMALL ANGLE OF ATTACK
A. Nakayama and W. L. Chow Apr. 1979 40 p refs
(Grant NGL-14-005-140)
(NASA-CR-158471; ME-TN-395-6; UILU-ENG-79-4001) Avail: NTIS HC A03/MF A01 CSCL 01A

A transonic flow past a boattailed afterbody under a small angle of attack was examined. It is known that the viscous effect offers significant modifications of the pressure distribution on the afterbody. Thus, the formulation for the inviscid flow was based on the consideration of a flow past a nonaxisymmetric body. The full three dimensional potential equation was solved through numerical relaxation, and quasi-axisymmetric boundary layer calculations were performed to estimate the displacement effect. It was observed again that the viscous effects were not negligible. The trend of the final results agreed well with the experimental data. J.A.M.

N79-21007# Aeronautical Research Inst. of Sweden, Stockholm.
MEASUREMENTS ON A THREE DIMENSIONAL SWEPT WING AT LOW SPEEDS. PART 1: THE FLOW AROUND THE LEADING EDGE
Arild Bertelrud 1977 109 p refs
(FFA Proj. AU-1320)
(FFA-130) Avail: NTIS HC A06/MF A01

As a part of a project on extrapolation from wind tunnel to flight, measurements in the boundary layer of a 3-D swept wing were made in a low speed wind tunnel. The report concerns the flow in the region close to the leading edge, and consists of static pressure measurements, measurements with heated films and some measurements with a single hot wire. Flow visualizations were made, and the measured pressure distribution and boundary layer characteristics compared with calculations. Two different flow patterns were investigated; natural transition and bubble transition. It is found that for the present wing the pressure distribution in the leading edge region back to 20-30% of the chord is well described by 2-D calculations modified to infinite swept wing conditions. At an angle of attack close to start of separation the attachment line flow probably becomes transitional/turbulent in the tested speed range, followed by relaminarization and bubble. According to calculations there should not be relaminarization in the flight case, despite strong indications from earlier flight tests of bubble separation. L.S.

N79-21008# Aeronautical Research Inst. of Sweden, Stockholm.
MEASUREMENTS ON A THREE DIMENSIONAL SWEPT WING AT LOW SPEEDS. PART 2: THE FLOW IN THE BOUNDARY LAYER ON THE MAIN WING
Arild Bertelrud 1977 83 p refs
(FFA Proj. AU-1320)
(FFA-131) Avail: NTIS HC A05/MF A01

As a part of a project on extrapolation from wind tunnel to flight, measurements in the boundary layer of a three-dimensional swept wing were made in a low speed wind tunnel. The report concerns the flow on the main part of the wing, and essentially time-averaged information. The experimental investigation consists of measurements of the static pressure distribution and also of measurements with total head/static probes. These also provide skin friction data. As the flow visualizations and the preliminary measurements indicated that the flow was close to two-dimensional, boundary layer rakes were used to get streamwise

information on the boundary layer profiles. Calculations of the static pressure distribution and the turbulent boundary layer characteristics have been performed and show good agreement with the experimental results. L.S.

N79-21009*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
BUMBLEBEE PROGRAM. AERODYNAMIC DATA. PART 1: SUPERSONIC FLOW FIELD, PRESSURE FIELD, AND PANEL LOAD DATA FOR VALIDATION OF COMPUTATIONAL METHODS Final Report
G. A. Barnes and L. L. Cronvich Mar. 1979 12 p refs
(NASA Order L-60036-A)
(NASA-CR-3114) Avail: NTIS HC A02/MF A01 CSCL 01A

The parts of an aerodynamics research project of the Bumblebee Program, called Generalized Missile study, is described. The source related, and potential applications are discussed. S.E.S.

N79-21010*# Beam Engineering, Inc., Sunnyvale, Calif.
STRUCTURE OF THE TURBULENT SEPARATED FLOW AROUND A STALLED AIRFOIL Interim Report
Alan J. Wadcock Feb. 1979 88 p refs
(Contract NAS2-10093)
(NASA-CR-152263) Avail: NTIS HC A05/MF A01 CSCL 01A

Hot-wire measurements were made in the boundary layer, the separated region, and the near wake for flow past a NACA 4412 airfoil at maximum lift. The Reynolds number based on chord was 1,500,000. Special care was taken to achieve a two-dimensional mean flow. Data were obtained at several thousand locations in the flow field. These data include intermittency, two components of mean velocity, and mean values for three double, four triple, and five quadruple products of two velocity fluctuations. No information was obtained about the third (spanwise) velocity component. Smoothing and interpolating routines were used to determine intermittency, two components of mean velocity, and mean values of three double, four triple, and five quadruple products of two velocity fluctuations on a fine rectangular mesh aligned with the airfoil chord. The data are presented in contour plots, in three-dimensional plots, and in tabular form. The format used to store the experimental data in digital form is described and a computer program which illustrates how this data can be accessed is presented. L.S.

N79-21011*# West Virginia Univ., Morgantown. Dept. of Aerospace Engineering.
GENERALIZATION OF ANALYTICAL TOOLS FOR HELICOPTER-ROTOR AIRFOILS Final Report
Edward H. Gibbs 18 Apr. 1979 14 p refs
(Grant NsG-1412)
(NASA-CR-158480) Avail: NTIS HC A02/MF A01 CSCL 01A

A state-of-the-art finite difference boundary-layer program incorporated into the NYU Transonic Analysis Program is described. Some possible treatments for the trailing edge region were investigated. Findings indicate the trailing edge region, still within the scope of an iterative potential flow, boundary layer program, appears feasible. S.E.S.

N79-21012# Boeing Vertol Co., Philadelphia, Pa.
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFIGURATION. VOLUME 4B: ONE-THIRD OCTAVE BAND SPECTROGRAMS OF WAKE SPLIT-FILM DATA, BASIC CONFIGURATION WAKE EXPLORATIONS Final Report, 15 Mar. 1977 - 13 Feb. 1978
Philip F. Sheridan Sep. 1978 331 p
(Contract DAAJ02-77-C-0020; DA Proj. 1L2-62209-AH-76)
(AD-A063712; USARTL-TR-78-23D-Vol-4B) Avail: NTIS HC A15/MF A01 CSCL 01/3

This is the second of the seven sub-volumes of Volume IV containing one-third octave band spectrographs of the model helicopter hub/rotor wake as it was modified by various aerodynamic devices. This sub-volume deals with wake characteristics of the baseline configurations. Author (GRA)

N79-21013# Boeing Vertol Co., Philadelphia, Pa.
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFIGURATION. VOLUME 4A: ONE-THIRD OCTAVE BAND SPECTROGRAMS OF WAKE SPLIT-FILM DATA, BUILDUP TO BASELINE Final Report, 15 Mar. 1977 - 13 Feb. 1978
Philip F. Sheridan Sep. 1978 214 p
(Contract DAAJ02-77-C-0020; DA Proj. 1L2-62209-AH-76)
(AD-A063711; USARTL-TR-78-23D-Vol-4A) Avail: NTIS HC A10/MF A01 CSCL 01/3

This is the first of the seven sub-volumes of Volume IV containing one-third octave band spectrographs of the model helicopter hub/rotor wake as it was modified by various aerodynamic devices. This sub-volume deals with the wake changes as the model is built up to the baseline configuration. Author (GRA)

N79-21014# Boeing Vertol Co., Philadelphia, Pa.
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFIGURATION. VOLUME 4-D: ONE-THIRD OCTAVE BAND SPECTROGRAMS OF WAKE SPLIT-FILM DATA, OPEN HUBCAPS Final Report, 15 Mar. 1977 - 13 Feb. 1978
Philip F. Sheridan Sep. 1978 401 p
(Contract DAAJ02-77-C-0020; DA Proj. 1L2-62209-AH-76)
(AD-A063214; USARTL-TR-78-23D-Vol-4D) Avail: NTIS HC A18/MF A01 CSCL 01/3

This is the fourth of the seven sub-volumes of Volume IV containing one-third octave band spectrographs of the model helicopter hub/rotor wake as it was modified by various aerodynamic devices. This sub-volume deals with the effects of various open hubcaps. Open caps have parallel undersides and uppersides. Author (GRA)

N79-21015# Boeing Vertol Co., Philadelphia, Pa.
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFIGURATION. VOLUME 7-B: FREQUENCY ANALYSES OF WAKE SPLIT-FILM DATA, BASIC CONFIGURATION WAKE EXPLORATIONS Final Report, Mar. 1977 - Feb. 1978
Philip F. Sheridan Sep. 1978 334 p
(Contract DAAJ02-77-C-0020; DA Proj. 1L2-62209-AH-76)
(AD-A063243; USARTL-TR-78-23G-Vol-7B) Avail: NTIS HC A15/MF A01 CSCL 01/3

This is the second of seven sub-volumes of Volume VII containing spectrographs of the model helicopter hub/rotor wake as it was modified by various aerodynamic devices. This sub-volume deals with wake characteristics of the baseline configurations. Author (GRA)

N79-21016# Boeing Vertol Co., Philadelphia, Pa.
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFIGURATION. VOLUME 4F: ONE-THIRD OCTAVE BAND SPECTROGRAMS OF WAKE SPLIT-FILM DATA, AIR EJECTORS WITH HUBCAPS, WINGS Final Report, 15 Mar. 1977 - 13 Feb. 1978
Philip F. Sheridan Sep. 1978 232 p
(Contract DAAJ02-77-C-0020; DA Proj. 1L2-62209-AH-76)
(AD-A063244; USARTL-TR-78-23D-Vol-4F) Avail: NTIS HC A11/MF A01 CSCL 01/3

This is the sixth of the seven sub-volumes of Volume IV containing one-third octave band spectrographs of the model helicopter hub/rotor wake as it was modified by various aerodynamic devices. This sub-volume deals with the effects of air ejector systems in configurations already possessing hub caps and also of several wing configurations mounted variously to alter the wake. Author (GRA)

N79-21017# Boeing Vertol Co., Philadelphia, Pa.
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFIGURATION. VOLUME 5: HARMONIC ANALYSES OF HUB WAKE Final Report, Mar. 1977 - Feb. 1978
Philip F. Sheridan Sep. 1978 239 p
(Contract DAAJ02-77-C-0020; DA Proj. 1L2-62209-AH-76)
(AD-78-A063245; USARTL-TR-23E-Vol-5) Avail: NTIS HC A11/MF A01 CSCL 01/3

Volume V of this series contains computer print-outs displaying the results of harmonic analyses of selected test runs. The steady and 10-harmonic coefficients for wake flow angles and associ-

ated velocity components are shown. This material is compiled to enable understanding of the wake structure additional to that derived from the spectrographs in other volumes. Author (GRA)

N79-21018# Boeing Vertol Co., Philadelphia, Pa.
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFIGURATION. VOLUME 4E: ONE-THIRD OCTAVE BAND SPECTROGRAMS OF WAKE SPLIT-FILM DATA, AIR EJECTORS Final Report, 15 Mar. 1977 - 13 Feb. 1978
Philip F. Sheridan Sep. 1978 342 p
(Contract DAAJ02-77-C-0020; DA Proj. 1L2-62209-AH-76)
(AD-A063653; USARTL-TR-78-23D-Vol-4E) Avail: NTIS HC A15/MF A01 CSCL 01/3

This is the fifth of the seven sub-volumes of Volume IV containing one-third octave band spectrographs of the model helicopter hub/rotor wake as it was modified by various aerodynamic devices. This sub-volume deals with the effects of various air ejector systems on the wake. Author (GRA)

N79-21019# ARO, Inc., Arnold Air Force Station, Tenn.
A METHOD OF CHARACTERISTICS COMPUTER PROGRAM FOR THREE-DIMENSIONAL SUPERSONIC INTERNAL FLOWS Final Report, Oct. 1977 - Sep. 1978
W. C. Armstrong Jan. 1979 96 p Sponsored by the Air Force
(AD-A063518; AEDC-TR-78-68) Avail: NTIS HC A05/MF A01 CSCL 20/4

The reference-plane method of characteristics is applied to the computation of the supersonic flow in a three-dimensional (3-D) channel such as a propulsion nozzle. The fluid is assumed to be an inviscid ideal gas and the flow is assumed to be shock-free, although it can be rotational. Both the basic equations and the numerical procedures are described, as is the computer program, which was written in FORTRAN IV language for the IBM 370/165 computer. The validity of the computer program was established by computing, in various ways, an axisymmetric nozzle flow as a three-dimensional flow; the numerical results are in good agreement with the results from a well-established computer program for axisymmetric flow. Author (GRA)

N79-21020# Aerospace Corp., El Segundo, Calif. Vehicle Engineering Div.
EVALUATION OF TOTAL HEAT TRANSFER IN HYPERSONIC FLOW ENVIRONMENTS Final Report, 1 Aug. 1976 - 30 Jun. 1978
R. L. Baker and R. E. Kramer Oct. 1978 46 p refs
(Contract F04701-77-C-0078)
(AD-A063708; TR-0078(3550-15)-3; SAMSO-TR-78-20) Avail: NTIS HC A03/MF A01 CSCL 20/4

Equations for the total heat transfer to bodies in constant hypersonic flow environments and a ballistic trajectory environment were derived. Using these equations and graphical results presented, total heat transfer can be easily evaluated for selected sphere-cone and flat-face cone geometries. Author (GRA)

N79-20992# National Aero- and Astronautical Research Inst., Amsterdam (Netherlands).
SCALE EFFECTS AT TRANSONIC SPEEDS BASIC CONSIDERATIONS
J. P. Hartzuiker *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 22 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

N79-20995# Technische Hochschule, Darmstadt (West Germany).
BOUNDARY LAYER EFFECTS ON PRESSURE VARIATIONS IN LUDWIEG TUBES
Eckart Piltz *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 7 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

N79-20996# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.
THE DESIGN OF WIND TUNNEL MODELS FOR TESTS AT TRANSONIC SPEEDS AND HIGH REYNOLDS NUMBERS
C. R. Taylor *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 36 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

N79-20999# Aircraft Research Association Ltd., Bedford (England).
POSSIBILITIES FOR SCALE EFFECT ON SWEPT WINGS AT HIGH SUBSONIC SPEEDS. RECENT EVIDENCE FROM PRESSURE PLOTTING TESTS
A. B. Haines *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 34 p refs Also presented at AGARD Fluid Dyn. Panel Specialists' Meeting, Goettingen, West Ger., 26-28 Apr. 1971 (For primary document see N79-20990 12-01)
(Rept-18; Paper-14) Avail: NTIS HC A17/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N79-21021*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OZONE CONTAMINATION IN AIRCRAFT CABINS
Washington, D. C. NASA Mar. 1979 81 p refs Workshop held at Moffett Field, Calif., 27-28 Jul. 1978
(NASA-CP-2066; E-9797) Avail: NTIS HC A05/MF A01 CSCL 06S

The problem and solution to the physical ozone irritation caused by ozone concentrations in the cabin of high-altitude aircraft are presented. For individual titles, see N79-21022 through N79-21031.

N79-21022*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OZONE CONTAMINATION IN AIRCRAFT CABINS: OBJECTIVES AND APPROACH
Porter J. Perkins *In its* Ozone Contamination in Aircraft Cabins Mar. 1979 p 1-2 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

Three panels were developed to solve the problem of ozone contamination in aircraft cabins. The problem is defined from direct in-flight measurements of ozone concentrations inside and outside airliners in their normal operations. Solutions to the cabin ozone problem are discussed under two areas: (1) flight planning to avoid high ozone concentrations, and (2) ozone destruction techniques installed in the cabin air systems. S.E.S.

N79-21023*# Federal Aviation Administration, Washington, D. C.
RECOMMENDATIONS OF THE PANELS: PANEL ON IN-FLIGHT MEASUREMENTS
Jim Rogers *In* NASA. Lewis Res. Center Ozone Contamination in Aircraft Cabins Mar. 1979 p 3-6 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

The attenuation factor for aircraft other than the B-747 in reducing the ambient ozone concentrations which enter the cabin is obtained. The need to continue NASA Global Air Sampling Program measurements was expressed for three main purposes; testing new filters, correlation of complaints with ozone levels, and ambient ozone data. The need to continue cooperation between NASA and industry is indicated. Concern with regard to the correlation of ozone levels and complaints was given. The need to measure the variability of ozone within the aircraft cabin was investigated. The requirement for an onboard ozone monitor on all aircraft is discussed. S.E.S.

N79-21024*# State Univ. of New York at Albany.
RECOMMENDATIONS OF THE PANELS: PANEL ON FLIGHT PLANNING TO AVOID HIGH OZONE

Volker Mohnen *In* NASA. Lewis Res. Center Ozone Contamination in Aircraft Cabins Mar. 1979 p 7-8 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

Flights planned or accomplished during certain months of the year at the higher latitudes and altitudes at or above the tropopause are discussed. Cabin ozone level limitations are established, and additional information is required for more accurate and qualtitative forecasting and design data base for operational utilization. Better tropopause heights, ozone concentration and corresponding meteorological data along selected flight routes, and meteorological data were investigated. S.E.S.

N79-21025*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RECOMMENDATIONS OF THE PANELS: PANEL ON OZONE DESTRUCTION TECHNIQUES
Ted Wydeven *In* NASA. Lewis Res. Center Ozone Contamination in Aircraft Cabins Mar. 1979 p 9-10 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

Catalyst materials to reduce weight, size, and cost of the ozone removal device were developed. Catalyst bed lifetime, competitive reactivity contaminants in the inlet air on the catalyst bed efficiency for ozone removal, and the kinetics and mechanism by which ozone is destroyed on selected catalysts were studied. S.E.S.

N79-21026*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OZONE CONTAMINATION IN AIRCRAFT CABINS: SUMMARY OF RECOMMENDATIONS
Porter J. Perkins *In its* Ozone Contamination in Aircraft Cabins Mar. 1979 p 11-12 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

Recommendations from the three panels on in-flight measurements, flight planning to avoid high ozone, and ozone destruction techniques are summarized. S.E.S.

N79-21027*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OZONE CONTAMINATION IN AIRCRAFT CABINS: POST WORKSHOP REVIEW OF RECOMMENDATIONS
Porter J. Perkins *In its* Ozone Contamination in Aircraft Cabins Mar. 1979 p 13-16 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

The recommendations, level of priority for accomplishment, and recommended approaches and responsibility for implementation as established by the review are presented. S.E.S.

N79-21028*# Civil Aeromedical Inst., Oklahoma City, Okla.
OZONE CONTAMINATION IN AIRCRAFT CABINS. APPENDIX A: OZONE TOXICITY
Carlton E. Melton *In* NASA. Lewis Res. Center Ozone Contamination in Aircraft Cabins Mar. 1979 p 17-20 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

The recommendation that at various altitudes the amount of air with which ozone has mixed changes, thus changing the volume per volume relationship is discussed. The biological effects of ozone on human health and the amount of ozone necessary to produce symptoms were investigated. S.E.S.

N79-21029*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OZONE CONTAMINATION IN AIRCRAFT CABINS. APPENDIX B: OVERVIEW PAPERS. IN-FLIGHT MEASUREMENTS
Porter J. Perkins *In its* Ozone Contamination in Aircraft Cabins Mar. 1979 p 21-29 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

The NASA Global Atmospheric Sampling Program ozone measurements were obtained to establish to characteristics of the ambient ozone concentration during routine operations and to determine the attenuation of ambient concentrations of cabin air systems from simultaneous ambient and in cabin measurements. The characteristics of ambient ozone include: (1) maximum concentration; (2) duration of ozone encounters; (3) frequency of ozone during a flight; (4) variability of ozone during a flight; (5) in relation to routes, altitude, and meteorological conditions. S.E.S.

N79-21030*# Control Data Corp., Minneapolis, Minn. Research Div.
OZONE CONTAMINATION IN AIRCRAFT CABINS. APPENDIX B: OVERVIEW PAPERS. FLIGHT S PLANNING TO AVOID HIGH OZONE
Arthur D. Belmont *In* NASA. Lewis Res. Center Ozone Contamination in Aircraft Cabins Mar. 1979 p 31-44 refs (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

The problem of preventing cabin ozone from exceeding a given standard was investigated. Statistical analysis of vertical distribution of ozone is summarized. The cost, logistics, maintenance, ability to forecast ozone, and avoiding high ozone concentrations are presented. Filtering approaches and the requirements to remove ozone toxicity are discussed. S.E.S.

N79-21031*# Boeing Commercial Airplane Co., Seattle, Wash.
OZONE CONTAMINATION IN AIRCRAFT CABINS: APPENDIX B: OVERVIEW PAPERS. OZONE DESTRUCTION TECHNIQUES
Ray Wilder *In* NASA. Lewis Res. Center Ozone Contamination in Aircraft Cabins Mar. 1979 p 45-70 (For primary document see N79-21021 12-03)
Avail: NTIS HC A05/MF A01 CSCL 06S

Ozone filter test program and ozone instrumentation are presented. Tables on the flight tests, samll scale lab tests, and full scale lab tests were reviewed. Design verification, flammability, vibration, accelerated contamination, life cycle, and cabin air quality are described. S.E.S.

N79-21032# Simat, Helliesen and Eichner, Inc., Washington, D. C.
ADDITIONAL ANALYSES OF AIR CARRIED LOAD FACTORS AND COMPETITION Final Report
Apr. 1978 106 p refs
(Contract DOT-OS-60501)
(PB-289577/9; DOT-P-50-78-4) Avail: NTIS HC A06/MF A01 CSCL 01B

Every competitive domestic market segment served by each airline is analyzed. The major results are: (1) the impact of CAB imposed operating restrictions result in sharply lower load factors for the restricted carriers than the unrestricted carriers; (2) carriers operate a large number of short haul (under 200 miles) entry or bridge segments with low load factors due to the interdependent nature of the markets; (3) load factors for unrestricted carriers do not invariably decline as the number of competitors increase; and (4) the impact on market load factors of a new unrestricted competitor will necessarily vary depending upon the cost and scheduling characteristics of the added competitor. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N79-21033*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
SIMULATION EVALUATION OF COMBINED 4D RNAV AND AIRBORNE TRAFFIC SITUATION DISPLAYS AND PROCEDURES APPLIED TO TERMINAL AERIAL MANEUVERS Semi-annual Progress Report, 1 Sep. 1978 - 1 Mar. 1979
Michael Athans and Mark E. Connelly 1 Mar. 1979 44 p

(Grant NsG-2180)
(NASA-CR-158474) Avail: NTIS HC A03/MF A01 CSCL 17G

Simulation scenarios were developed in which subject pilots must simultaneously follow a 3D terminal airspace structure and arrive at fixed waypoints within the structure precisely at pre-scheduled times in the presence of a full range of wind conditions aloft, and monitor nearby traffic on an airborne traffic situation display, especially during merging and spacing operations, and detect blunders and resolve conflicts in a safe manner. Open-loop simulator tests of the single-stage 4D RNAV algorithm indicate that a descending pilot can comply quite closely with an assigned time of arrival at a 3D waypoint simply by tracking a pre-calculated speed profile. Initial experiments show that the aircraft arrives at the 3D waypoint within a few seconds of the anticipated time. The presence of headwinds or tailwinds does not affect the arrival time error as long as the wind is accurately modeled in the descent algorithm. Results all but guarantee that a 5 second standard deviation in arrival time error can be realized in closed-loop descents at very moderate pilot workload levels. A.R.H.

N79-21034*# Ohio Univ., Athens. Avionics Engineering Center.
LORAN-C FLIGHT DATA BASE
Robert W. Lilley Feb. 1979 12 p refs
(Grant NGR-36-009-017)
(NASA-CR-158380; TM-67) Avail: NTIS HC A02/MF A01 CSCL 17G

Loran-C time-difference data were collected on January 9, 1979 during a flight from Athens, Ohio to Madison VOR in Connecticut, thence to Millville VOR in New Jersey, and a landing at Atlantic City NAFEC. Portions of the return trip to Athens, Ohio were also recorded. Loran-C GRI data frames were recorded using the 99600 U. S. Northeast Loran chain stations Seneca/Nantucket (TDA) and Seneca/Carolina Beach (TDB). The GRI sequence number TDA and TDB were recorded as integer numbers, with the TD's in integer microseconds. Actual time-of-day can be determined from the data start time, plus the time per GRI and the sequence number. The low cost Loran-C receiver was used to obtain the time-difference data for each GRI. Data was recorded on digital magnetic tape and post-processed into latitude and longitude using an IBM system/370 computer. J.A.M.

N79-21035*# Ohio Univ., Athens. Avionics Engineering Center.
RESULTS OF THE SECOND FLIGHT TEST OF THE LORAN-C RECEIVER/DATA COLLECTION SYSTEM
Joseph P. Fischer Mar. 1979 9 p refs
(Grant NGR-36-009-017)
(NASA-CR-158381; TM-68) Avail: NTIS HC A02/MF A01 CSCL 17G

The components of the Loran-C navigation system which were developed thus far are a phase-locked-loop receiver and a microcomputer development system. The microcomputer is being used as a means of testing and implementing software to handle sensor control and navigation calculations. Currently, the microcomputer is being used to collect and record data from the receiver in addition to development work. With these components, it was possible to record receiver data over a period of time and then reduce this data to obtain statistical information. It was particularly interesting to load the equipment developed in the laboratory into an aircraft and collect data while in flight. For initial flight tests, some important considerations were how well the entire system will perform in the field, signal strength levels while on the ground and in the air, the amount of noise present, changing of signal-to-noise ratio for various aircraft configurations and maneuvers, receiver overloading due to other equipment and antennas, and the overall usefulness of Loran-C as a navigation aid. J.A.M.

N79-21036# Federal Aviation Administration, Washington, D. C. Systems Research and Development Service.
MASTER PLAN FLIGHT SERVICE STATION AUTOMATION PROGRAM
Jan. 1978 82 p refs
(AD-A052001/5; FAA-FSS-01A) Avail: NTIS HC A05/MF A01 CSCL 17/7

The Master Plan for the Flight Service Automation Program is a planning document for the implementation of the Flight Service Information System and serves as the acquisition authorization document. This document contains background and introductory information relating to the present system of 292 manned domestic Flight Service Stations, program objectives, requirements, planning guidelines, systems and system interface descriptions, scheduling and implementation information, relationships with other major programs, management method, logistics, staffing, training, security, and financial planning information. Author

N79-21037# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
A NEW BASELINE FOR THE INERTIAL NAVIGATION STRAPDOWN SIMULATOR PROGRAM. VOLUME 1: INTRODUCTION AND SUMMARY Progress Report, 1 Jun. 1977 - 15 Jul. 1978
Roy J. Nurse, John T. Prohaska, and Darold G. Riegsecker Jul. 1978 15 p ref 4 Vol.
(Contract F33615-75-C-1149; AF Proj. 6095)
(AD-A062807; R-1136-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 17/7

This four-volume report describes an updated and expanded version of a direct, digital, modular simulation of a strapdown inertial navigation system employing a wander-azimuth computational frame, and subject to a six degree of freedom random vibration environment. The original version of this simulation was developed under Task 4.2.3(a) of the above contract during 1975 and 1976. The user may simulate not only the gross dynamics of the flight profile (from an external or internal profile generation) but also the angular and linear random vibrations resulting from gusts and turbulence acting on the airframe. The total environment is applied to the models of the inertial components (laser or SDR gyros and pendulous accelerometers). The resulting outputs of simulated IMU are summed in an interface module and compensated and scaled in the simulated navigation computer. The latter also contains the velocity/attitude algorithm, which computes the body-to-inertial transformation, using either the direction cosine matrix or quaternion, and the navigation algorithm which numerically integrates the specific forces after transformation to the local vertical, wander azimuth computational frame. The outputs of the simulated navigation computer are the computed position, velocity, and attitude of the vehicle with respect to a local vertical, north pointing frame. The flight profile and the differences between it and the simulated navigation computer outputs are tabulated in an evaluation module for printing, plotting, or post processing. GRA

N79-21038# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
A NEW BASELINE FOR THE INERTIAL NAVIGATION STRAPDOWN SIMULATOR PROGRAM. VOLUME 2: ANALYTICAL DEVELOPMENT Progress Report, 1 Jun. 1977 - 15 Jul. 1978
Roy J. Nurse, John T. Prohaska, and Darold G. Riegsecker Jul. 1978 208 p refs 4 Vol.
(Contract F33615-75-C-1149; AF Proj. 6095)
(AD-A062808; R-1136-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 17/7

Volume 2 of a four volume report is presented. The four volume report describes an update and expanded version of a direct, digital, modular simulation of a strapdown inertial navigation system employing a wander-azimuth computational frame, and subject to a six degree of freedom random vibration environment. Volume 2 contains analytical development of the equations to be mechanized and the transition to difference equation form. G.Y.

N79-21039# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
A NEW BASELINE FOR THE INERTIAL NAVIGATION STRAPDOWN SIMULATOR PROGRAM. VOLUME 3: PROGRAM AND DESCRIPTION AND USERS GUIDE Progress Report, 1 Jun. 1977 - 15 Jul. 1978
Roy J. Nurse, John T. Prohaska, and Darold G. Riegsecker Jul. 1978 220 p
(Contract F33615-75-C-1149; AF Proj. 6095)
(AD-A062809; R-1136-Vol-3) Avail: NTIS HC A10/MF A01 CSCL 17/7

This four-volume report describes an updated and expanded

version of a direct, digital, modular simulation of a strapdown inertial navigation system employing a wander-azimuth computational frame, and subject to a six degree of freedom random vibration environment. The original version of this simulation was developed under Task 4.2.3(a) of the above contract during 1975 and 1976. The user may simulate not only the gross dynamics of the flight profile (from an external or internal profile generation) but also the angular and linear random vibrations resulting from gusts and turbulence acting on the airframe. The total environment is applied to the models of the inertial components (laser or SDR gyros and pendulous accelerometers). The resulting outputs of simulated IMU are summed in an interface module and compensated and scaled in the simulated navigation computer. The latter also contains the velocity/attitude algorithm, which computes the body-to-inertial transformation, using either the direction cosine matrix or quaternion, and the navigation algorithm which numerically integrates the specific forces after transformation to the local vertical, wander azimuth computational frame. The outputs of the simulated navigation computer are the computed position, velocity, and attitude of the vehicle with respect to a local vertical, north pointing frame. The flight profile and the differences between it and the simulated navigation computer outputs are tabulated in an evaluation module for printing, plotting, or post processing. GRA

N79-21040# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
A NEW BASELINE FOR THE INERTIAL NAVIGATION STRAPDOWN SIMULATOR PROGRAM. VOLUME 4: PROGRAM LISTINGS Progress Report, 1 Jun. 1977 - 15 Jul. 1978
Roy J. Nurse Jul. 1978 106 p 4 Vol.
(Contract F33615-75-C-1149; AF Proj. 6095)
(AD-A062810; R-1136-Vol-4) Avail: NTIS HC A06/MF A01 CSCL 17/7

This four-volume report describes an updated and expanded version of a direct, digital, modular simulation of a strapdown inertial navigation system emping a wander-azimuth computational frame, and subject to a six degree of freedom random vibration environment. The original version of this simulation was developed under Task 4.2.3(a) of the above contract during 1975 and 1976. The user may simulate not only the gross dynamics of the flight profile(from an external or internal profile generation) but also the angular and linear random vibrations resulting from gusts and turbulence acting on the airframe. The total environment is applied to the models of the inertial components (laser or SDR gyros and pendulous accelerometers). The resulting outputs of simulated IMU are summed in an interface module and compensated and scaled in the simulated navigation computer. The latter also contains the velocity/attitude algorithm, which computes the body-to-inertial transformation, using either the direction cosine matrix or quaternion, and the navigation algorithm which numerically integrates the specific forces after transformation to the local vertical, wander-azimuth computational frame. The outputs of the simulated navigation computer are the computed position, velocity, and attitude of the vehicle with respect to a local vertical, north pointing frame. The computer outputs are tabulated in an evaluation module for printing, plotting, or post processing. GRA

N79-21041# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
THE NEAR-TERM POTENTIAL OF DOPPLER LOCATION
R. R. Newton Sep. 1978 56 p refs
(Contract N00024-78-C-5384)
(AD-A063615; APL/JHU-TG-1318) Avail: NTIS HC A04/MF A01 CSCL 17/7

In this report the precision that can be obtained in locating a point on the earth's surface by analyzing the Doppler shift in the signals from a near-earth satellite is explored. When the discussion to the use of techniques that have been demonstrated in the laboratory but that may not have been introduced into field use, is limited, it is found that the precision obtained by using the data from a single pass of a satellite should be about 18 cm. It should be possible to improve the precision by using data from more than one pass in the usual statistical fashion.
Author (GRA)

N79-21042# Army Military Personnel Center, Alexandria, Va.
A FEASIBILITY STUDY OF AN ALTERNATIVE POWER AND CONTROL SYSTEM FOR A HIGH PRECISION GYRO M.S. Thesis - MIT. Final Report
Marc Normand Richard Dec. 1978 166 p refs
(AD-A063591; T-676) Avail: NTIS HC A08/MF A01 CSCL 17/7

A new gyro wheel drive system composed of an induction motor on the same shaft as, and in electrical series with, a permanent magnet motor was designed, analyzed, implemented, and tested. Its open loop operating characteristics were determined for both a voltage source and current source power stage. The system is too unreliable in the open loop mode for high precision gyro applications. A closed loop control scheme that relies upon the sensed back EMF of the PM motor was developed to commutate the two motor system. Its steady state and transient response characteristics were documented. It was shown that the entire system employing the two motors and closed loop control algorithm can start the gyro, accelerate it up to synchronous speed, and maintain synchronous lock much more effectively and efficiently than previously used hysteresis synchronous motor systems. Also, it was demonstrated that the same system can power the gyro through a rotary transformer interface with little degradation in system performance. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N79-21043*# Boeing Commercial Airplane Co., Seattle, Wash.
EVALUATION OF LAMINAR FLOW CONTROL SYSTEM CONCEPTS FOR SUBSONIC COMMERCIAL TRANSPORT AIRCRAFT Summary Report, Sep. 1976 - Sep. 1978
Hampton, Va. NASA Jan. 1979 79 p refs
(Contract NAS1-14630)
(NASA-CR-158998) Avail: NTIS HC A05/MF A01 CSCL 01C

Results of a 2-year study are reported which were carried out to extend the development of laminar flow control (LFC) technology and evaluate LFC systems concepts. The overall objective of the LFC program is to provide a sound basis for industry decisions on the application of LFC to future commercial transports. The study was organized into major tasks to support the stated objectives through application of LFC systems concepts to a baseline LFC transport initially generated for the study. Based on competitive evaluation of these concepts, a final selection was made for incorporation into the final design of an LFC transport which also included other advanced technology elements appropriate to the 1990 time period. G.Y.

N79-21044*# Boeing Commercial Airplane Co., Seattle, Wash.
DEVELOPMENT OF INTEGRATED PROGRAMS FOR AEROSPACE-VEHICLE DESIGN (IPAD): REFERENCE DESIGN PROCESS Final Report
Donald D. Meyer Mar. 1979 370 p
(Contract NAS1-14700)
(NASA-CR-2981; D6-IPAD-70010-D) Avail: NTIS HC A16/MF A01 CSCL 01C

The airplane design process and its interfaces with manufacturing and customer operations are documented to be used as criteria for the development of integrated programs for the analysis, design, and testing of aerospace vehicles. Topics cover: design process management, general purpose support requirements, design networks, and technical program elements. Design activity sequences are given for both supersonic and subsonic commercial transports, naval hydrofoils, and military aircraft. A.R.H.

N79-21045# Army TRADOC Systems Analysis Activity, White Sands Missile Range, N. Mex.
FLIGHT PROFILE PERFORMANCE HANDBOOK. VOLUME 6: OH-58C (KIOWA)
Nathan H. Cleek, Jr. and Alan J. Wolfe Nov. 1978 131 p

(AD-A063754; TRASANA-TR-3-78-Vol-6) Avail: NTIS HC A07/MF A01 CSCL 01/2

The purpose for preparing this handbook series is fourfold: (1) to validate KIOWA performance data quickly; (2) to reduce the manpower and time to prepare accurate flight profiles; (3) to standardize performance data so that the analysis community can benefit from a single reference in conducting studies; and (4) to provide a handbook that can be used for training in the mission profile planning area. This volume of the handbook contains tables with the precise performance data and format required to develop flight profiles for computer simulations. GRA

N79-21046# Army TRADOC Systems Analysis Activity, White Sands Missile Range, N. Mex.

FLIGHT PROFILE PERFORMANCE HANDBOOK. VOLUME 9: UH-1H (HUEY)

Nathan H. Cleek, Jr. and Alan J. Wolfe Nov. 1978 128 p

(AD-A063756; TRASANA-TR-3-78-Vol-9) Avail: NTIS HC A07/MF A01 CSCL 01/2

The purpose for preparing this handbook series is fourfold: (a) to validate HUEY performance data quickly, (b) to reduce the manpower and time to prepare accurate flight profiles, (c) to standardize performance data so that the analysis community can benefit from a single reference in conducting studies and (d) to provide a handbook that can be used for training in the mission profile planning area. This volume of the handbook contains tables with the precise performance data and format required to develop flight profiles for computer simulations. GRA

N79-21047# Textron Bell Helicopter, Ft. Worth, Tex.

ENGINE/AIRFRAME/DRIVE TRAIN DYNAMIC INTERFACE DOCUMENTATION Final Report, Sep. 1977 - Aug. 1978

H. W. Hanson, R. W. Balke, B. D. Edwards, W. W. Riley, and B. D. Downs Oct. 1978 204 p refs

(Contract DAAJ02-77-C-0045; DA Proj. 1L2-62209-AH-76)

(AD-A063237; USARTL-TR-78-15) Avail: NTIS HC A10/MF A01 CSCL 01/3

The purpose of this program was to survey Bell Helicopter Textron past and present experiences as related to gas-turbine-powered helicopter engine/airframe/drive train dynamic interface problems as part of an overall Government effort to define specific areas in which future research funding should be placed to develop improved design, analytical and test methods to ensure helicopter dynamic compatibility. Thirteen dynamic interface problems were documented with a detailed discussion, solutions considered and/or applied, and identifiable shortcomings. Recommendations are made for future research funding in five specific areas. The appendixes provide the detailed documentation for each of the dynamic interface problems. Author (GRA)

N79-20991# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

THE PROBLEM: AIRCRAFT IN TRANSONIC FLIGHT

B. H. Goethert *In its* Transonic Aerodyn. Testing Jan. 1972 40 p refs (For primary document see N79-20990 12-01)

Avail: NTIS HC A17/MF A01

N79-20997# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

FLIGHT TEST TECHNIQUES FOR A TRANSONIC AIRCRAFT

J. M. Lewendon *In its* Transonic Aerodyn. Testing Jan. 1972 32 p (For primary document see N79-20990 12-01)

Avail: NTIS HC A17/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N79-21048# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.

DIGITAL AVIONICS INFORMATIONS SYSTEM (DAIS) SERIAL INPUT/OUTPUT (I/O) EXERCISE Interim Technical Report, Nov. 1977 - Jan. 1978

James C. Caffrey Sep. 1978 35 p

(AF Proj. 2052)

(AD-A062646; AFAL-TR-78-141) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Digital Avionics Information System (DAIS) Test Facility requires a means for exercising the serial output and input interface devices of the remote terminal. This report describes the design and operation of the unit needed to perform this function.

Author (GRA)

N79-21049# Naval Avionics Center, Indianapolis, Ind.

AN OVERVIEW OF AVIONICS TECHNOLOGIES FOR THE IMPROVEMENT OF ALL WEATHER ATTACK AVIONICS SYSTEM (AWAAS) OPERATIONAL READINESS IN THE 1980 - 1990 TIME FRAME

John J. Cicak Sep. 1978 93 p

(AD-A062812; NAC-TR-2180) Avail: NTIS HC A05/MF A01 CSCL 01/3

A broad assessment is made of the technological development required to improve the overall readiness of all weather attack avionic systems to be developed in the 1980-1990 time frame. The projected state-of-the-art in the post 1980 time frame is briefly outlined and the additional development required to achieve significant improvements in system readiness is summarized. Areas of technological risk are identified. GRA

N79-21050# General Dynamics Corp. Fort Worth, Tex.

F-16 ADVANCED ELECTRO-OPTICAL POD FIELD-OF-VIEW SIMULATION STUDY Final Report

13 Dec. 1978 124 p refs

(Contract F33657-78-C-0290)

(AD-A063530; FZM-6817) Avail: NTIS HC A06/MF A01 CSCL 17/8

An F-16 advanced electro-optical(EO) pod field of view(FOV) simulation study was accomplished to determine the effects of sensor FOV and field-of-regard (FOR) on the pilot's workload and ability to locate, acquire, and attack targets in a day weapons-delivery environment. The simulated EO pod had a slewable TV sensor and laser designator head with two selectable FOVs for the TV sensor(wide and narrow FOVs), selectable area correlation and contrast tracking modes, and the capability to be either slaved to a preprogrammed set of coordinate or slaved to the aircraft's velocity vector. Each experiment was designed around a laser-guided weapon and a corresponding weapon delivery mode. The weapons simulated in the study were chosen from current and potential (weapons under development) laser-guided ordnance -- GBU-10, Laser Guided Maverick, and Sabre. The weapon-delivery modes simulated were derived from basic F-16 avionics capabilities. The weapons and weapon delivery modes were chosen to interact with the FOVs of the simulated EO pod so that each FOV pair could be evaluated under separate acquisition range, weapons delivery, and target constraints. GRA

N79-21051# IBM Federal Systems Div., Owego, N. Y.

PROGRAM DOCUMENTATION FOR THE HELMET-MOUNTED-DISPLAY PROCESSOR FLIGHT SOFTWARE

J. Mras, W. E. Brandt, J. L. Nagel, and G. M. Sebasky Wright-Patterson AFB, Ohio AMRL Feb. 1978 53 p

(Contract F33615-75-C-5152; AF Proj. 7184)

(AD-A063312; AMRL-TR-78-36; AMRL-HESS-78-3) Avail: NTIS HC A04/MF A01 CSCL 09/2

The flight software executes in the Helmet-Mounted-Display Processor (HMDP) to provide vector-graphic displays that may be viewed on a helmet-mounted display (HMD), or a heads-up display (HUD). There are several different display formats, each of which is selectable via pushbutton switches mounted in a cockpit mockup. In addition, to these display selection inputs, the program is responsive to data value inputs which can be expressed using these same pushbuttons under various modes. Dynamic data received from actual aircraft electronics units are accommodated by an analog input capability and a synchro input capability. These dynamic inputs define the aircraft state and the helmet pointing angles to the flight software program. The various display generation routines that comprise the flight software program use these dynamic and static inputs to derive meaningful flight displays in several specific orientations, all of

which are dynamically responsive to aircraft translation and rotation, as well as head pointing angle. In addition, the vector-graphics displays when viewed on the HMD may be mixed with a T.V. image. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N79-21052*# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Mechanical and Industrial Engineering.

FLUID DYNAMIC PROBLEMS ASSOCIATED WITH AIR-BREATHING PROPULSIVE SYSTEMS Final Report

W. L. Chow May 1979 51 p ref

(Grant NGL-14-005-140)

(ME-TR-395-7; UILU-ENG-79-4002) Avail: NTIS HC A04/MF A01 CSCL 21A

A brief account of research activities on problems related to air-breathing propulsion is made in this final report for the step funded research grant NASA NGL 14-005-140. Problems include the aircraft ejector-nozzle propulsive system, nonconstant pressure jet mixing process, recompression and reattachment of turbulent free shear layer, supersonic turbulent base pressure, low speed separated flows, transonic boattail flow with and without small angle of attack, transonic base pressures, Mach reflection of shocks, and numerical solution of potential equation through hodograph transformation. J.A.M.

N79-21053# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

PROCEEDINGS OF THE SEMINAR ON ADVANCED PROBLEMS IN TURBOMACHINERY, PART 1

K. Cassady, ed. and J. Chauvin, ed. Oct. 1965 200 p refs Seminar held at Rhode-Saint-Genese, Belgium, 29-30 Mar. 1965 2 Vol.

(VKI-Lecture-Series-1-Pt-1) Avail: NTIS HC A09/MF A01

Topics discussed include; methods of prediction of turbomachine performance, cascade flows and validity of application to actual cascades, advanced transonic and supersonic compressors, high turning blading for axial flow machines, and turbomachinery space applications. For individual titles, see N79-21054 through N79-21062.

N79-21054# Technische Hochschule, Hanover (West Germany).

THE MORE-DIMENSIONAL CALCULATION OF AXIAL TURBOMACHINES

K. Fiedler *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 24 p ref (For primary document see N79-21053 12-07)

Avail: NTIS HC A09/MF A01

The Navier-Stokes Differential Equations are used to describe the flow in any turbomachinery. Cylindrical coordinates are applied to these equations for the problems in axial turbomachines. S.E.S.

N79-21055# Rolls-Royce Ltd., Derby (England).

A SIMPLE CORRELATION OF TURBINE EFFICIENCY

S. F. Smith *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 24 p (For primary document see N79-21053 12-07)

Avail: NTIS HC A09/MF A01

The test techniques and a simple method of correlation which relates the efficiency of some 70 turbine stages to the velocity triangles and enables the efficiency of those turbines are presented. The measured value of turbine efficiency can be markedly influenced by the measurement techniques, so the way in which the turbines are manufactured and tested, is described. S.E.S.

N79-21056# Liverpool Univ. (England).

CIRCUMFERENTIAL ASYMMETRY IN AXIAL FLOW COMPRESSORS

M. D. C. Doyle, S. L. Dixon, and J. H. Horlock *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 16 p refs (For primary document see N79-21053 12-07)

Avail: NTIS HC A09/MF A01

Circumferential inlet distortion and self induced flow asymmetry in axial flow compressors where the distortion of the velocity profile is too large to be described as a small perturbation are discussed. Prediction is presented of the compressor characteristics in the inlet distortion stage. Prediction of the compressor characteristics in the stalled region is described. S.E.S.

N79-21057# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

GENERAL DISCUSSION OF METHODS OF PREDICTION OF TURBOMACHINE PERFORMANCE

In its Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 17 p (For primary document see N79-21053 12-07)

Avail: NTIS HC A09/MF A01

The problem of radical equilibrium distortion by blade rows in annular channels is described. The influence produced by a non free vortex whirl of a blade row which results in a change of the axial velocity distribution was examined. An engineering method to predict that flow in the actuator disc theory is described. The variable displacement of the blade row along the blade height was investigated. S.E.S.

N79-21058# English Electric Co. Ltd., Whetstone (England). Mechanical Engineering Lab.

RESTRICTIVE ASSUMPTIONS AND RANGE OF VALIDITY OF SCHLICHTING'S CASCADE ANALYSIS

R. I. Lewis, P. D. Cliff, and Y. M. Yip *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 45 p ref (For primary document see N79-21053 12-07)

Avail: NTIS HC A09/MF A01

Restrictions imposed by the assumptions of Schlichting's cascade theory for slender airfoils were examined. Modifications to the source series to remove the the assumption of a cusp trailing edge are suggested and illustrated by comparison with exact theory. Two high camber cascade analyses are compared with the exact solution of Merchant and Collar. Comparisons are given for isolated profiles obtained by the Joukowski transformation. A number of comparisons with experimental hydrofoil cascade tests and with published cascade theories are presented. S.E.S.

N79-21059# Rolls-Royce Ltd., Derby (England).

TWO-DIMENSIONAL COMPRESSIBLE POTENTIAL FLOW AROUND PROFILES IN CASCADE

D. Price *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 19 p ref (For primary document see N79-21053 12-07)

Avail: NTIS HC A09/MF A01

The extension of the Martensen method to compressible flows is presented. The compressible potential equation is approximated by a Poisson equation which is solved by a singularity method. S.E.S.

N79-21060# Rolls-Royce Ltd., Derby (England).

A STALL CRITERION FOR CASCADES **c07**

R. M. Raley *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 18 p (For primary document see N79-21053 12-07)

Avail: NTIS HC A09/MF A01

A criterion for stall in axial compressors which is easy to apply is presented. The scope of the investigation is discussed and its present position is described. A diffusion factor based on the ratio of component of the outlet velocity in the inlet direction to the inlet velocity was studied. The critical value of the diffusion factor which depends upon the camber and the ratio of some passage or flow width to the chord length is summarized. S.E.S.

N79-21061# Liverpool Univ. (England).
PRESSURE DISTRIBUTIONS ON AXIAL FLOW COMPRESSOR BLADING AND COMPARISON WITH DISTRIBUTIONS ON SIMILAR CASCADE BLADING
M. D. C. Doyle and R. Shaw *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 15 p refs (For primary document see N79-21053 12-07)
Avail: NTIS HC A09/MF A01

Pressure distributions on the inlet guide vane, rotor, and stator blades of a low speed axial flow compressor were obtained at various Reynolds numbers, angles of incidence, and a axial velocity ratios. For one particular incidence these distributions are compared with those obtained from cascade tests of similar blading over approximately the same range of Reynolds numver and axial velocity ratio. S.E.S.

N79-21062# International Research and Development Co. Ltd., Newcastle (England). Theoretical Section.
A THEORY OF THE REPRESENTATION OF THE PROPERTIES OF BOUNDARY LAYERS ON A PLANE
J. LeFoll *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 42 p refs (For primary document see N79-21053 12-07)
Avail: NTIS HC A09/MF A01

The problem of controlling the behavior of both laminar and turbulent boundary layers on a body is discussed. The use of the representation in connection with the design of turbulent blades is described. The variation of velocity and energy loss along the arc length is presented. A mathematical image of the boundary layer is developed from a plane curve. S.E.S.

N79-21063# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
PROCEEDINGS OF THE SEMINAR ON ADVANCED PROBLEMS IN TURBOMACHINERY, PART 2
K. Cassady, ed. and J. Chauvin, ed. Oct. 1965 215 p refs In ENGLISH and FRENCH Seminar held at Rhode-Saint-Genese, Belgium, 29-30 Mar. 1965 2 Vol.
(VKI-Lecture-Series-1-Pt-2) Avail: NTIS HC A10/MF A01

Part 2 of a two part document is presented. Part 2 is divided into three sections which cover the following general topics: (1) advanced transonic and supersonic compressors; (2) high turning blading for axial flow machines; and (3) turbomachinery space applications. For individual titles, see N79-21064 through N79-21072.

N79-21064# Daimler-Benz, A.G., Stuttgart (West Germany). Turbomachinery Dept.
STATISTICAL STUDY OF SUPERSONIC COMPRESSORS [ETUDE STATISTIQUE DE COMPRESSEURS SUPERSONIQUES]
O. Conrad *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 2 Oct. 1965 41 p refs In FRENCH (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

Measurements and calculations exist for a large number of supersonic compressors. It is difficult to point out the reason for the differences in their efficiency. To determine the factors which influence compressor efficiency, flow data are calculated for all supersonic compressors whose field characteristics and geometric data are known. Transl. by A.R.H.

N79-21065# Technische Univ., Aachen (West Germany). Inst. for Turbomachinery.
INVESTIGATIONS ON SUPERSONIC DECELERATING CASCADES
W. Dettmering *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 2 Oct. 1965 8 p (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

Results of experimental investigations on supersonic decelerating cascades are given. The cascades deflect the flow very strongly and decelerate it from supersonic to subsonic velocities. In one case there is a reasonable improvement in the flow losses to be seen. G.Y.

N79-21066# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). Turbomachinery Lab.
ON THE USE OF A PSEUDO-SHOCK SYSTEM IN SUPERSONIC COMPRESSORS
F. Breugelmans *In its* Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 2 Oct. 1965 32 p refs (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

The pipe flow with pseudo-shocks is presented as a diffusion process for a supersonic compressor. The pipe flow characteristics are calculated for a specific heat ratio range from 1.4 to 1.10. The practical application of a pipe flow is studied in cascade and rotor configuration. Cascade tests were carried out at air inlet M numbers from 1.35 to 1.70. Rotor tests are carried out in Freon-12-air mixture gamma about 1.20 up to blade tip relative M numbers of 1.50. G.Y.

N79-21067# Deutsche Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
THE NASA-LANGLEY 7-INCH TRANSONIC CASCADE WIND TUNNEL AT THE DEUTSCHE VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT AND FIRST TEST RESULTS
W. Heilmann *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 2 Oct. 1965 25 p refs (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

After discontinuation of the turbomachine research program the Langley Field 7-inch transonic cascade wind tunnel was transferred to the von-Karman-institute at Brussels. However, the available air supply was not sufficient for operating this tunnel. The tunnel was installed and equipped with new instrumentation and it was put into operation in 1964. The following topics are reported: (1) description of the tunnel; (2) instrumentation; (3) data reduction (wake and surface pressure distribution measurements); (4) the Schlieren system; and (5) control of boundary layer suction. The results of the first test are given. G.Y.

N79-21068# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). Turbomachinery Lab.
HIGH TURNING BLADING FOR AXIAL FLOW MACHINES. INTRODUCTION AND SUMMARY OF THE PROBLEMS
J. Chauvin *In its* Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 2 Oct. 1965 9 p refs (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

The problem of turning flow of a large angle arises frequently in turbomachinery. The same problem arises in the subsonic and transonic ranges in the root section of rotors and stators of advanced axial compressors, and in the last stage of light weight engines. The problem also arises in transonic flow for the stator of certain types of supersonic compressors and in the inducer part of radial compressors. The biggest problems encountered in high turning blading arise from the decelerating cascades. There appears the problem of limit loading and of boundary layer behavior, when speaking of a two dimensional flow. There are the additional complications of three dimensional or secondary flow arising from the viscous interaction between wall boundary layers and blade boundary layers. These problems are introduced and discussed. G.Y.

N79-21069# Liverpool Univ. (England).
THE CALCULATION ON INCOMPRESSIBLE FLOW THROUGH CASCADES OF HIGHLY CAMBERED BLADES
J. P. Gostelow *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 2 Oct. 1965 25 p refs (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

An exact solution to the potential flow around highly cambered blades in cascade is given for certain profiles having rounded trailing edges. The solution is used for checking the accuracy of existing methods of calculation at two high values of camber. An iterative procedure, in use for calculating the effect of the boundary layer on the pressure distribution, is described. This process includes the effect of wake curvature and gives a unique value of circulation around the profile. Author

N79-21070# International Research and Development Co. Ltd., Newcastle (England).
EXTENSIONS TO THE TESTED RANGE OF A CASCADE FLOW CALCULATION METHOD
W. S. Hall *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. In Turbomachinery, Pt. 2 Oct. 1965 10 p refs (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

Some additional results which extend the tested range of mathematical validity of a conformal transformation method for calculating the inviscid, incompressible flow about a cascade of aerofoils of general geometry are presented. Author

N79-21071# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). Turbomachinery Lab.
ON THE OPTIMIZATION OF THE FLOW IN HIGH TURNING DECELERATING BLADES BY MEANS OF AXIAL VELOCITY VARIATION
A. Janigro *In its* Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 2 Oct. 1965 24 p refs (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

A method is given for the analysis of the kinetic field due to a uniform flow in a cascade, when changes in axial velocity are taken into account having in view the optimization of velocity profiles to avoid boundary layer separation. G.Y.

N79-21072# Air Force Systems Command, Wright-Patterson AFB, Ohio.
SUMMARY OF APPLIED RESEARCH PROGRAMS BEING CONDUCTED ON MINIATURE TURBOMACHINES FOR PRODUCING CRYOGENIC TEMPERATURES OPERATING ON GAS BEARINGS TURBO COMPRESSORS AND EXPANDERS UTILIZING HELIUM AND NITROGEN AS WORKING FLUIDS
F. R. Stidham *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 2 Oct. 1965 26 p (For primary document see N79-21063 12-07)
Avail: NTIS HC A10/MF A01

An attempt is made to briefly summarize the work going on at the author's laboratory and other places. The programs are presented in a brief outline form. G.Y.

N79-21073*# Detroit Diesel Allison, Indianapolis, Ind.
STUDY OF AN ADVANCED GENERAL AVIATION TURBINE ENGINE (GATE) Final Report
J. C. Gill, F. R. Short, D. V. Staton, B. A. Zolezzi, C. E. Curry, M. J. Orelup, J. M. Vaught, and J. M. Humphrey 10 Apr. 1979 147 p refs
(Contract NAS3-20756)
(NASA-CR-159558; DDA-EDR-9528) Avail: NTIS HC A07/MF A01 CSCL 21E

The best technology program for a small, economically viable gas turbine engine applicable to the general aviation helicopter and aircraft market for 1985-1990 was studied. Turboshaft and turboprop engines in the 112 to 746 kW (150 to 1000 hp) range and turbofan engines up to 6672 N (1500 lbf) thrust were considered. A good market for new turbine engines was predicted for 1988 providing aircraft are designed to capitalize on the advantages of the turbine engine. Parametric engine families were defined in terms of design and off-design performance, mass, and cost. These were evaluated in aircraft design missions selected to represent important market segments for fixed and rotary-wing applications. Payoff parameters influenced by engine cycle and configuration changes were aircraft gross mass, acquisition cost, total cost of ownership, and cash flow. Significant advantage over a current technology, small gas turbine engines was found especially in cost of ownership and fuel economy for airframes incorporating an air-cooled high-pressure ratio engine. A power class of 373 kW (500 hp) was recommended as the next frontier for technology advance where large improvements in fuel economy and engine mass appear possible through component research and development. S.E.S.

N79-21074*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
CF6 JET ENGINE PERFORMANCE IMPROVEMENT PROGRAM. TASK 1: FEASIBILITY ANALYSIS Final Report
W. A. Fasching Mar. 1979 300 p refs
(Contract NAS3-20629)
(NASA-CR-159450; R79AEG295) Avail: NTIS HC A13/MF A01 CSCL 21E

Technical and economic engine improvement concepts selected for subsequent development include: (1) fan improvement; (2) short core exhaust; (3) HP turbine aerodynamic improvement; (4) HP turbine roundness control; (5) HP turbine active clearance control; and (6) cabin air recirculation. The fuel savings for the selected engine modification concepts for the CF6 fleet are estimated. S.E.S.

N79-21075*# Ford Motor Co., Dearborn, Mich. Research Staff.
EVALUATION OF CERAMICS FOR STATOR APPLICATION: GAS TURBINE ENGINE REPORT Progress Report, 1 Feb. 1978 - 31 Jul. 1978
W. Trela and P. H. Havstad Nov. 1978 36 p refs Prepared for DOE
(Contract DEN-3-00019)
(NASA-CR-159533; DOE/NASA/0019-78/1) Avail: NTIS HC A03/MF A01 CSCL 21E

Current ceramic materials, component fabrication processes, and reliability prediction capability for ceramic stators in an automotive gas turbine engine environment are assessed. Simulated engine duty cycle testing of stators conducted at temperatures up to 1093 C is discussed. Materials evaluated are SiC and Si3N4 fabricated from two near-net-shape processes: slip casting and injection molding. Stators for durability cycle evaluation and test specimens for material property characterization, and reliability prediction model prepared to predict stator performance in the simulated engine environment are considered. The status and description of the work performed for the reliability prediction modeling, stator fabrication, material property characterization, and ceramic stator evaluation efforts are reported. J.M.S.

N79-21076*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
JT8D REVISED HIGH-PRESSURE TURBINE COOLING AND OTHER OUTER AIR SEAL PROGRAM
W. O. Gaffin 20 Mar. 1979 59 p refs
(Contract NAS3-20630)
(NASA-CR-159551; PWA-5515-77) Avail: NTIS HC A04/MF A01 CSCL 21E

The JT8D high pressure turbine was revised to reduce leakage between the blade tip shrouds and the outer air seal, and engine testing was performed to determine the effect on performance. The addition of a second knife-edge on the blade tip shroud, the extension of the honeycomb seal land to cover the added knife-edge and an existing spoiler on the shroud, and a material substitution in the seal support ring to improve thermal growth characteristics are included. A relocation of the blade cooling air discharge to insure adequate cooling flow is required. Significant specific fuel consumption and exhaust gas temperature improvements were demonstrated with the revised turbine in sea level and simulated altitude engine tests. Inspection of the revised seal hardware after these tests showed no unusual wear or degradation. S.E.S.

N79-21077# ARO, Inc., Arnold Air Force Station, Tenn.
IN SITU OPTICAL TECHNIQUES FOR JET ENGINE EXHAUST HYDROCARBON DETECTION Final Report, Sep. 1976 - Oct. 1977
C. J. Fisher AEDC Nov. 1978 65 p refs
(ZF57572002)
(AD-A061673; AEDC-TR-78-39) Avail: NTIS HC A04/MF A01 CSCL 21/5

An investigation was conducted to determine the feasibility of developing an in situ optical technique suitable for jet engine exhaust diagnostics of gaseous hydrocarbon concentrations. Two absorption spectroscopy techniques were investigated: (1) high-resolution interferometric spectroscopy in the 1/2800-3250 cm region of the IR and (2) the absorption of the radiation of a modified He-Ne laser emitting in the IR. A candidate for use as a radiation source in a correlation spectrometer, a microwave-excited methane infrared source, was also evaluated. Another spectroscopic technique, the detection of CH visible emission, was also investigated. As a means of investigating the possible

effects of mechanical probing on the chemical identity and hence the spectroscopic properties of the hydrocarbon constituents of exhaust gases, a simulation of the effects of probing on methane containing exhaust constituents was performed. A preliminary investigation of the gaseous hydrocarbon content of a combustor using in situ optical probing and online conventional gas analyzers as well as optical probing and laboratory gas analysis of samples drawn with an orifice-type emissions probe is also reported. It was concluded that the best approach to in situ gaseous hydrocarbon detection may be a multiple-pass, tuneable diode laser system. GRA

N79-21078# Lundgren (Dale A.), Gainesville, Fla.
LOW EFFICIENCY CONTROL MEASURES FOR JET ENGINE TEST CELLS Final Report, Apr. - Sep. 1978
Dale A. Lundgren Sep. 1978 25 p refs
(Contract F08637-78-M-1387)
(AD-A062665; CEEDO-TR-78-53) Avail: NTIS HC A02/MF A01 CSCL 21/2

This report summarizes the findings of low cost, relatively low efficiency emission control measures for reduction of jet engine test cell opacity to less than 20%. The recommended cost effective opacity reduction system consists of an effective water spray system; a glass fiber mist eliminator; a medium efficiency, high velocity, throw-away type glass fiber filter media; and a reduced test cell discharge area. The report discussed the following topics: control methods, opacity, scrubbers, demisters, and filters. Author (GRA)

N79-21079# Naval Research Lab., Washington, D. C.
THREE-DIMENSIONAL PHOTOELASTIC STRESS ANALYSIS OF THE DOVETAIL REGION OF THE TF-30 TURBINE ENGINE'S THIRD-STAGE FAN Final Report
V. J. Parks and R. J. Sanford 29 Dec. 1978 32 p refs
(AD-A063300; NRL-8276) Avail: NTIS HC A03/MF A01 CSCL 21/5

Three-dimensional photoelastic analysis of the disk/blade dovetail region of the TF-30 turbine engine's third-stage fan indicates peak stresses in the disk and blade fillets that are an order of magnitude greater than the average stress in the neck of the disk lug. Maximum stress concentrations found in the fillets of the disk lugs for representative loads are: 9.6 for centrifugal load; 12.6 for centrifugal load with 12% circumferential component; and 10.6 for centrifugal load with an 18% antiplane component. The addition of circumferential or antiplane bending components to the centrifugal load increased the peak stress and shifted it toward the region of the fillet where fractures were observed. The analysis gives quantitative indication of the significance of bending in the failure of disk lugs. Author (GRA)

N79-21080# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTAL INVESTIGATION OF TURBOJET TEST CELL AUGMENTORS Final Report
Charles N. Sapp, Jr. and David W. Netzer Sep. 1978 71 p refs
(AD-A063172; NPS67-78-009) Avail: NTIS HC A04/MF A01 CSCL 21/5

A one-eighth scale turbojet test cell was used to investigate the effects of various design parameters on augmentor performance. The augmentor inlet design, nozzle-to-augmentor spacing; engine flow rate, nozzle total temperature and pressure, and augmentor tube diameter were varied to determine what effect they had on augmentation ratio, total air pumped through the system, and pressure, temperature, and velocity distributions within the augmentor tube. In addition, two augmentor tubes were combined in tandem to investigate the characteristics of a tertiary augmentor configuration. Author (GRA)

N79-21081# General Electric Co., Lynn, Mass. Aircraft Engine Group.
REFINEMENT OF CASTING TECHNIQUES FOR SMALL AIR-COOLED TURBINE BLADES, PHASE 1A Final Report, Sep. 1975 - Dec. 1977
G. Steele Irons Nov. 1978 39 p
(Contract DAAJ02-73-C-0106)
(AD-A063211; USARTL-TR-78-36) Avail: NTIS HC A03/MF A01 CSCL 21/5

The design of the T700 stage-one turbine blade was reevaluated to permit application of advanced coring techniques to investment cast turbine blades. Small cores were machined to produce turbulators within the cored passages and bent to provide serpentine cooling passages. Injection molding of ceramic materials was investigated as a method of reducing the cost of small intricate cores. These techniques resulted in improved use of cooling air, and they can increase blade life or specific fuel consumption over the standard configuration. Design history, manufacturing steps, qualification procedures, and cost analysis are discussed for the Advanced Core Technology blade. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N79-21082# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DETERMINATION OF THE STABILITY AND CONTROL DERIVATIVES FOR THE VARIABLE-RESPONSE RESEARCH AIRCRAFT USING A MODIFIED MAXIMUM LIKELIHOOD ESTIMATOR M.S. Thesis
Jean Michel Fernand Sep. 1978 141 p refs
(AD-A063270; AFIT-CI-79-43T) Avail: NTIS HC A07/MF A01 CSCL 01/3

A maximum likelihood estimation program was applied to flight data for Princeton's Variable-Response Research Aircraft to determine its primary stability and control derivatives. The control derivatives for the side-force surfaces and the rudder were of special interest. The effects of measurement noise and process noise on parameter identification also were studied. This investigation showed that the maximum likelihood estimation program used identifies derivatives which produce close fits of the measured time histories. Standard deviations of the derivations computed from several time histories indicate the quality of the estimates. The reduction in standard deviations when estimates were separated by type and direction of control input time history used indicates that derivative estimates are affected by the assumptions inherent in the analytical model and the signal-to-noise ratios of the data. The method used for identifying highly correlated derivatives also affected the estimates obtained. The final set of derivatives determined in this research produced a good fit of the measured data and several of the derivatives agreed well with analog matching derivative estimates. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N79-21083* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND TUNNEL Patent
Eldon M. Wilson, inventor (to NASA) (Garrett Corp., Los Angeles) Issued 8 Jul. 1969 3 p Filed 22 Jun. 1967 Sponsored by NASA
(NASA-Case-LAR-10135-1; US-Patent-3,453,878; US-Patent-Appl-SN-648034; US-Patent-Class-73-147) Avail: US Patent and Trademark Office CSCL 14B

A supersonic wind wind tunnel is described for testing several air foils mounted in a row. A test section of a wind tunnel contains means for mounting air foil sections in a row, means for rotating each section about an axis so that the angle of attack of each section changes with the other sections, and means for rotating the row with respect to the air stream so

that the row forms an oblique angle with the air stream.
Official Gazette of the U.S. Patent and Trademark Office

N79-21084* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYPERVELOCITY GUN Patent
Franklin C. Ford (MB Assoc., San Ramon, Calif.) and Arthur J. Biehl, inventors (to NASA) Issued 21 Dec. 1965 3 p filed 7 Jun. 1962 Sponsored by NASA
(NASA-Case-XLE-03186-1; US-Patent-3,224,337; US-Patent-Appl-SN-200770; US-Patent-Class-89-8) Avail: US Patent and Trademark Office CSCL 14B

A velocity amplifier system which uses both electric and chemical energy for projectile propulsion is provided in a compact hypervelocity gun suitable for laboratory use. A relatively heavy layer of a tamping material such as concrete encloses a loop of an electrically conductive material. An explosive charge at least partially surrounding the loop is adapted to collapse the loop upon detonation of the charge. A source of electricity charges the loop through two leads, and an electric switch which is activated by the charge explosive charge, disconnects the leads from the source of electricity and short circuits them. An opening in the tamping material extends to the loop and forms a barrel. The loop, necked down in the opening, forms the sabot on which the projectile is located. When the loop is electrically charged and the explosive detonated, the loop is short circuited and collapsed thus building up a magnetic field which acts as a sabot catcher. The sabot is detached from the loop and the sabot and projectile are accelerated to hypervelocity.
Official Gazette of the U.S. Patent and Trademark Office

N79-21085# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
VKI SHORT COURSE ON ADVANCED SHOCK TUBE TECHNIQUES, VOLUME 1
Feb. 1969 382 p refs Course held at Rhode-Saint-Genese, Belgium, 10-14 Feb. 1969 2 Vol.
(VKI-Lecture-Series-11-Vol-1) Avail: NTIS HC A17/MF A01

The von Karman Institute Short Course was organized with the intent to bring together information on the latest facilities and experimental techniques of shock tubes. Since the scope of shock tubes is very wide, only a few topics were selected. The following lecture topics are presented: (1) intermittent facilities; (2) piston driven facilities application of dense gas effects; (3) piston driven facilities; (4) chemical kinetics studies in shock tubes; (5) radiation studies in shock tubes; and (6) the use of the shock tubes as a spectroscopic source with an application to the measurement of gf-value for lines of neutral and singly ionized chromium. For individual titles, see N79-21086 through N79-21091.

N79-21086# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
INTERMITTENT FACILITIES
K. R. Enkenhus *In its* VKI Short Course on Advan. Shock Tube Tech., Vol. 1 Feb. 1969 48 p refs Also presented at VKI Lecture, Rhode-Saint-Genese, Belgium, 24-25 Apr. 1967 (For primary document see N79-21085 12-09)
Avail: NTIS HC A17/MF A01

Two lectures are presented. The first deals with the problem of simulation. A review of intermittent flow facilities is presented by considering the requirements for simulating the flight of ballistic and lifting reentry vehicles. In the second lecture, a variety of intermittent short duration facilities, their theory of operation, applications and limitations, and future trends are discussed. The facilities include the simple shock tube and the extensions in its performance obtained by using combustion and electrically heated drivers, the implosion shock tube, and shock expansion tube; the hotshot, the shock tunnel and gun tunnel; and the ballistics range. G.Y.

N79-21087# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
PISTON DRIVEN FACILITIES APPLICATION OF DENSE REAL GAS EFFECTS
Kurt R. Enkenhus *In its* VKI Short Course on Advan. Shock Tube Tech., Vol. 1 Feb. 1969 55 p refs (For primary document see N79-21085 12-09)
Avail: NTIS HC A17/MF A01

The lecture is divided into three sections. The first deals with the derivation of some thermodynamic relations. The topics discussed in this section include Maxwell's equation; the first and second TdS equations; the energy equation; the difference in heat capacities; expressions for calculating the speed of sound; and the entropy equation. The second section deals with the thermodynamics of a high pressure gas. The topics discussed include the behavior of a gas a thigh pressures; Vander Waal's equation; the Abel-Noble equation of state and other equations of state; an equation of state using reduced variables; and thermodynamic properties of the Herschfelder gas. The third section deals with applications to intermittent facilities, dense gas properties. Examples are given and numerically solved in the first two sections. G.Y.

N79-21088# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
PISTON DRIVEN FACILITIES
B. E. Richards *In its* VKI Short Course on Advan. Shock Tube Tech., Vol. 1 Feb. 1969 26 p refs (For primary document see N79-21085 12-09)
Avail: NTIS HC A17/MF A01

Piston driven facilities are becoming widely used for the production of hot, high pressure gases. The following topics are discussed: (1) studies in high pressure and temperature gases produced by isentropic compression; (2) hypersonic wind tunnels drive by free piston cycle compression; (3) piston driven shock tubes; (4) high speed guns; (5) high pressure-chamber design; (6) hot gas measurement using ultrasonics; and (7) laser-Schlieren-phototube techniques for measuring densities. G.Y.

N79-21089# Southampton Univ. (England).
CHEMICAL KINETIC STUDIES IN SHOCK TUBES
Kenneth N. C. Bray *In* Von Karman Inst. for Fluid Dyn. VKI Short Course on Advan. Shock Tube Tech., Vol. 1 Feb. 1969 48 p refs (For primary document see N79-21085 12-09)
Avail: NTIS HC A17/MF A01

The shock tube provides an almost ideal method of studying the rates of gas-phase reactions at high temperatures. A gas sample is uniformly heated in a time of the order of a few n sec to a temperature of some thousands of degrees. The progress of the resulting reaction may then be observed, under almost uniform conditions and in the absence of wall effects, for a time of the order of 100 microsec. After a brief review of some concepts from chemical kinetics, the lectures discusses the planning, instrumentation and analysis of shock tube experiments. Author

N79-21090# Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics.
RADIATION STUDIES IN SHOCK TUBES
Thomas D. Wilkerson *In* Von Karman Inst. for Fluid Dyn. VKI Short Course on Advan. Shock Tube Tech., Vol. 1 Feb. 1969 108 p refs (For primary document see N79-21085 12-09)
Avail: NTIS HC A17/MF A01

The following topics are discussed: (1) the shock tube as a thermal light source; (2) line and continuum radiation from gases in local thermal equilibrium; line strengths and profiles, autoionization, neutral bremsstrahlungen, opacity and total energy in complicated spectra, refractive index of plasmas due to free electrons and to atomic transitions, methods of observation and measurement in the infrared, visible and ultra violet; (3) case review of several basic experiments; and (4) review of applications to astrophysics, reentry phenomena and processes in gas lasers. Author

N79-21091# Michigan Univ., Ann Arbor. Dept. of Physics.
THE USE OF THE SHOCK TUBE AS A SPECTROSCOPIC SOURCE WITH AN APPLICATION TO THE MEASUREMENT OF gf-VALUES FOR LINES OF NEUTRAL AND SINGLY IONIZED CHROMIUM
T. Wilkerson *In* Von Karman Inst. for Fluid Dyn. VKI Short Course on Advan. Shock Tube Tech., Vol. 1 Feb. 1969 21 p refs (For primary document see N79-21085 12-09)
(Contract AF 49(638)-439; ORA Proj. 02822)
Avail: NTIS HC A17/MF A01

With chromium carbonyl as the additive, the gas behind the reflected shock emits intense lines of neutral and singly ionized chromium (Cr1 and Cr2). Line intensities are measured by heterochromatic photometry, using the anode crater of a carbon arc as the primary radiation standard. The state of the gas is computed from shock tube theory, taking account of dissociation, ionization and excitation. Computed atomic populations are used, in conjunction with the theory of radiative transfer, to derive absolute gf-values of the lines from their observed intensities. Observations are made of the ionization relaxation relaxation of Cr1 immediately behind the reflected shock. Thermodynamic functions governing dissociation, ionization and excitation were computed for several atoms, ions and molecules and are presented. G.Y.

N79-21092# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
VKI SHORT COURSE ON ADVANCED TUBE TECHNIQUES, VOLUME 2
Feb. 1969 94 p refs Course held at Rhode-Saint-Genese, Belgium, 10-14 Feb. 1969 2 Vol.
(VKI-Lecture-Series-11-Vol-2) Avail: NTIS HC A05/MF A01

Boundary layer's effect on the flow in a shock tube is discussed from a predicted theory. Methods of ensuring that these effects remain minimal are presented. For individual titles, see N79-21093 through N79-21096.

N79-21093# National Physical Lab., Teddington (England).
VISCOUS EFFECTS ON SHOCK TUBE FLOWS. 1: LAMINAR AND TURBULENT BOUNDARY LAYERS
Llynn Davies *In* Von Karman Inst. for Fluid Dyn. VKI Short Course on Advan. Shock Tube Tech., Vol. 2 Feb. 1969 11 p refs (For primary document see N79-21092 12-09)
Avail: NTIS HC A05/MF A01

The laminar, transitional, and turbulent boundary layer characteristics were studied in shock tube flow. The tracer method was developed to solve the problem of measuring boundary layer velocity profiles. The density profiles of shock tube boundary layers is measured using an interferometric techniques. The heat transfer to the walls of the shock tube is predicted for both the laminar and turbulent cases. The point of which transition occurs is estimated from a wall temperature measurement using a platinum resistance thermometer. S.E.S.

N79-21094# National Physical Lab., Teddington (England).
VISCOUS EFFECTS ON SHOCK TUBE FLOWS. 2: NON-IDEAL SHOCK-TUBE BEHAVIOR CAUSED BY BOUNDARY LAYER GROWTH
Llynn Davis *In* Von Karman Inst. for Fluid Dyn. VKI Short Course on Advan. Shock Tube Tech., Vol. 2 Feb. 1969 8 p refs (For primary document see N79-21092 12-09)
Avail: NTIS HC A05/MF A01

Various equations are used to describe the viscous effects on shock tube flow in pressure, density, and flow velocity. The testing time is defined as being the time between the arrival of the shock and contact surface at some fixed station in the tube. The non-uniformity in the core flow was investigated using different free stream density and pressure. S.E.S.

N79-21095# National Physical Lab., Teddington (England).
VISCOUS EFFECTS ON SHOCK TUBE FLOWS. 3: REFLECTED-SHOCK WAVES
Llynn Davis *In* Von Karman Inst. for Fluid Dyn. VKI Short Course on Advan. Shock Tube Tech., Vol. 2 Feb. 1969 13 p refs (For primary document see N79-21092 12-09)
Avail: NTIS HC A05/MF A01

The influence of reflected shock and boundary layer interaction on shock tube flow is discussed. Realistic boundary layer models are developed. The duration of high temperature in the reflected shock region is measured. Bifurcation of transmitted shock, time of arrival of cold gas at the end plate, bifurated foot model, and growth rate of the bifurated foot were studied. S.E.S.

N79-21096# National Physical Lab., Teddington (England).
ON THE EQUILIBRIUM PISTON TECHNIQUE IN GUN TUNNELS
Llynn Davis *In* Von Karman Inst. for Fluid Dyn. VKI Short Course on Advan. Shock Tube Tech., Vol. 2 Feb. 1969 14 p refs (For primary document see N79-21092 12-09)
Avail: NTIS HC A05/MF A01

The high peak pressures are reduced to obtain in the reservoir of gun tunnels as the piston comes to rest. The theory and experiment are compared to show that a close estimate of the piston weight required for equilibrium operations exists. The non-dimensional piston mass increases, and fixed initial pressure of the equilibrium piston weight increases for gun tunnel operations are discussed. S.E.S.

N79-21097*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND TUNNEL REAL-TIME DATA ACQUISITION SYSTEM
Patricia Cole 1979 23 p refs
(NASA-TM-80081) Avail: NTIS HC A02/MF A01 CSCL 14B

The hardware configuration is described for the data acquisition system (DAS) which consists of an analog front end that can process up to 260 channels of data, a multichannel analog-to-digital subsystem that can process up to 50,000 samples of data per second, and a digital computer with standard and nonstandard devices, including graphics capability. Also described are the software configuration of the DAS and complex hardware/software interfaces providing, for example, automatic amplifier gain and offset adjustment for each data channel. Specific DAS applications are summarized, including the real time processing of dynamic deflection data, unsteady pressure measurements, and flutter and buffet data. J.A.M.

N79-21098# Aeronautical Research Labs., Melbourne (Australia).
A SIMPLE METHOD OF ADAPTING A WIND TUNNEL SCHLIEREN SYSTEM FOR INTERFEROMETRY
N. Pollock Jun. 1978 38 p refs
(ARL-Aero-Note-378; AR-001-281) Avail: NTIS HC A03/MF A01

A simple method of adapting a wind tunnel Schlieren system for interferometry is described. This new interferometer arrangement employs a laser light source, a lens which splits off the reference beam after test beam expansion, and a lens and Lloyd mirror to recombine the two beams. The reference beam passes through the test section but is contracted to a narrow waist and displaced well away from the model location. The proposed design combines a number of favorable characteristics which render it particularly useful for wind tunnel tests. These characteristics include: simplicity, optical robustness, low vibration sensitivity, modest coherence requirements, and ease of interferogram analysis. The main disadvantage is that slightly less than half of the total field of view can be recorded on a single interferogram. Interferograms obtained from tests on a prototype instrument based on a Schlieren system of low mechanical rigidity are presented. A comparison between aerofoil pressure distributions obtained by direct measurement and by interferogram analysis is reported. Author

N79-21099# Teledyne Ryan Aeronautical Co., San Diego, Calif.
MINI-RPV LAUNCH SYSTEM CONCEPTUAL STUDY Final Report
H. E. Dickard Dec. 1978 216 p refs
(Contract DAAJ02-77-C-0048; DA Proj. 1L2-62209-AH-76)
(AD-A062990; TRA-29318-07; USARTL-TR-78-49) Avail: NTIS HC A10/MF A01 CSCL 01/3

This study investigates and evaluates Mini-RPV launch concepts potentially suitable for the U. S. Army tactical environment. The air vehicle on which the launch study is based is the U. S. Army/Lockheed Aquila XMQM-105 Mini-RPV at a nominal gross weight of 120 pounds. A hypothetical RPV counterpart at 200 pounds gross weight is also used to bound the upper weight limit for Mini-RPVs. As a result of the Mini-RPV concept investigations and evaluations, it is recommended that in-depth studies be initiated to provide information for higher level evaluations based on detailed technical definitions related to both the pneumatic and the rocket-boosted systems. Additionally, information on the effects of parachute recovery on RPV and launcher design parameters is provided. GRA

N79-21100# AeroVironment, Inc., Pasadena, Calif.
EVALUATION OF EMISSION CONTROL STRATEGIES FOR AIRFIELD OPERATIONS AT THE LOS ANGELES AND SAN FRANCISCO INTERNATIONAL AIRPORTS Final Report

C. Gary Gelinas Aug. 1978 110 p refs Sponsored by California Air Resources Board
(PB-289622/3; AV-FR-8059) Avail: NTIS HC A06/MF A01 CSCL 01E

Potential air pollutant emission reductions which could be achieved by various strategies to control airfield operations at Los Angeles and San Francisco International Airports are reviewed. Safety problems, cost impacts, potential fuel savings, time frame for strategy implementation, and potential regulatory and jurisdictional conflicts associated with each strategy are among the factors considered. Airfield emission sources studied included aircraft operation in the idle, taxi, takeoff, and landing modes; ground service vehicles; fuel handling and storage; and aircraft engine maintenance. GRA

N79-21101# Systems Technology, Inc., Hawthorne, Calif.
DEVELOPMENT AND CALIBRATION OF AN AERODYNAMIC DISTURBANCE TEST FACILITY. VOLUME 1: EXECUTIVE SUMMARY
Richard H. Klein, Henry R. Jex, Arthur A. Blauvelt, and Irving L. Ashkenas Jun. 1978 31 p refs
(Contract DOT-HS-6-01403)
(PB-291045/3; TR-1085-1-1-Vol-1; DOT-HS-803616) Avail: NTIS HC A03/MF A01 CSCL 13F

The development of an aerodynamic disturbance test facility that can be used to study the influence of crosswind disturbances on road vehicle handling is discussed. A literature review of ambient wind measurements, wind tunnel tests, and accident data were combined with driving simulator tests and closed loop analysis to develop the requirements for a low cost transportable, easy to operate, rugged, test facility. The final product consists of 8 independent crosswind modules, capable of providing a relatively constant 35 mph gust over 130 ft test length. Arranging the modules in a semi-random fashion can provide a variable velocity profile over 230 ft test length. GRA

N79-21102# Systems Technology, Inc., Hawthorne, Calif.
DEVELOPMENT AND CALIBRATION OF AN AERODYNAMIC DISTURBANCE TEST FACILITY. VOLUME 2: DEVELOPMENT OF REQUIREMENTS AND PRELIMINARY DESIGN
Final Report, Jul. 1976 - Jun. 1978
Richard H. Klein, Irving L. Ashkenas, and Henry R. Jex Jun. 1978 82 p refs
(Contract DOT-HS-6-01403)
(PB-291046/1; TR-1085-1-2-Vol-2; DOT-HS-803617) Avail: NTIS HC A05/MF A01 CSCL 13F

The development of a design for an aerodynamic disturbance test facility that can be used to study the influence of crosswind disturbances on road vehicle handling is discussed. A literature review of ambient wind measurements, wind tunnel tests, and accident data was combined with driving simulator tests and closed loop analysis to develop the requirements for a low cost, transportable, easy to operate, rugged, test facility. The final product consists of 8 independent crosswind modules, which, when aligned side are capable of providing a relatively constant 35 mph gust over 130 ft test length. Arranging the modules in a semi-random fashion can provide a variable velocity profile over 230 ft test length. GRA

N79-21103# Systems Technology, Inc., Hawthorne, Calif.
DEVELOPMENT AND CALIBRATION OF AN AERODYNAMIC DISTURBANCE TEST FACILITY. VOLUME 3: CONSTRUCTION, CALIBRATION, AND OPERATION
Final Report, Jul. 1976 - Jun. 1978
Richard H. Klein, Arthur A. Blauvelt, and Paul G. VanValkenburgh Jun. 1978 56 p
(Contract DOT-HS-6-01403)
(PB-291047/9; TR-1085-1-3; DOT-HS-803618) Avail: NTIS HC A04/MF A01 CSCL 13F

The construction of a low cost, transportable, easily operated, rugged apparatus, containing 8 independent crosswind modules, capable of providing a relatively constant 35 mph gust over 130 ft for use in studying the influence of crosswind on road vehicle handling is described. Random arrangement of the modules provised a variable velocity over 230 ft test length. The ignition of the 58 HP gasoline engine and the speed of the fan in each module can be remotely controlled from a distance of 200 ft. Calibration plots and operating procedures are given. GRA

N79-20993# ARO, Inc., Arnold Air Force Station, Tenn.
TRANSONIC WIND TUNNELS
Michael Pindzola *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 88 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

N79-20994*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DESIGN AND CHARACTERISTICS OF HIGH REYNOLDS NUMBER TEST FACILITIES: THE LUDWIG TUBE
A. R. Felix *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 38 p (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01 CSCL 14B

N79-20996# Institute of Fluid Mechanics and Aerospatial Design, Bucharest (Rumania).
EXPERIMENTAL TECHNIQUES FOR TRANSONIC TESTING IN SHOCK TUBES
Lucian Z. Dumitrescu *In* Von Karman Inst. for Fluid Dyn. Transonic Aerodyn. Testing Jan. 1972 43 p refs (For primary document see N79-20990 12-01)
Avail: NTIS HC A17/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N79-21104*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
REFERENCE MISSION: THE 1981 MARS LANDING WITH INBOUND VENUS SWINGBY
9 Apr. 1970 170 p refs
(NASA-TM-79942; MSC/IN/70-FM-66) Avail: NTIS HC A08/MF A01 CSCL 22A

A Mars landing mission and each phase of the mission are described. The trajectory, mission profile, and sequence of major events are discussed. S.E.S.

N79-21105*# Massachusetts Inst. of Tech., Cambridge. Dept. of Material Science and Engineering.
CRYSTAL GROWTH OF DEVICE QUALITY GaAS IN SPACE
Annual Report, 1 Apr. 1978 - 31 Mar. 1979
Harry C. Gatos and Jacek Lagowski Apr. 1979 97 p refs
(Grant NsG-7331)
(NASA-CR-158481) Avail: NTIS HC A05/MF A01 CSCL 20L

The optimization of space processing of GaAs is described. The detailed compositional, structural, and electronic characterization of GaAs on a macro- and microscale and the relationships between growth parameters and the properties of GaAs are among the factors discussed. The key parameters limiting device performance are assessed. J.M.S.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N79-21488*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
RECENT ADVANCES IN ANALYTICAL SATELLITE THEORY
E. M. Gaposchkin *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 197-206 refs (For primary document see N79-21460 12-42)
(Contract F19628-78-C-0216)
Avail: NTIS HC A16/MF A01 CSCL 22A

N79-21489*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

RECENT ADVANCES IN COMPUTATIONAL TECHNIQUES
David E. Smith *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 207-211 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N79-21106# Visidyne, Inc., Burlington, Mass.
DESIGN AND TEST OF A MOBILE MISSION CONTROL STATION FOR USE IN BALLOONBORNE INFRARED RESEARCH EXPERIMENTS (BAMM PROJECT) Scientific Report, 1 Jul. 1976 - 31 Mar. 1978
W. F. Grieder, D. J. Messuri, T. P. Wheeler, and R. D. Bucknam 10 Apr. 1978 52 p
(Contract F19628-76-C-0198; AF Proj. 2310)
(AD-A063193; VI-BAMM-4; SCIENTIFIC-2; AFGL-TR-78-0104)
Avail: NTIS HC A04/MF A01 CSCL 17/2

This report describes the design, fabrication, and field deployment of a mobile electronics semitrailer used to control and command balloonborne infrared research experiments. Systems to provide real time display of telemetered data, uplink control of payload functions and near real time data reduction of infrared spectrometer outputs using a PDP-11 computer to perform Fast Fourier Transforms are included. Author (GRA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N79-21107 Ohio State Univ., Columbus.
ESTIMABILITY AND SIMPLE DYNAMICAL ANALYSES OF RANGE (RANGE-RATE AND RANGE-DIFFERENCE) OBSERVATIONS TO ARTIFICIAL SATELLITES Ph.D. Thesis
Boudewijn Hendricus Willem VanGelder 1978 285 p
Avail: Univ. Microfilms Order No. 7908229

The estimable quantities are indicated for simple dynamical analyses of range (range-rate and range-difference) observations to artificial satellites. The philosophy of the analysis is based on non-Bayesian statistics. No a priori knowledge for the parameters is assumed, but mathematical models are developed with unconditional estimable parameters. The simulation studies centered around laser range observations to LAGEOS. The capabilities of satellite laser ranging are evaluated. The satellite measurement system under investigation may fall short in precise determinations of the earth's orientation and the earth's rotation. Relative station positioning, determination of (differential) polar motion, positioning of stations with respect to the earth's center of mass and determination of the earth's gravity field should be easily realized by satellite laser ranging. Dissert. Abstr.

N79-21108* National Aeronautics and Space Administration, Washington, D. C.
TECHNOLOGY FOR LARGE SPACE SYSTEMS: A SPECIAL BIBLIOGRAPHY WITH INDEXES
Apr. 1979 159 p Prepared in part by NASA Langley Res. Center
(NASA-SP-7046) Avail: NTIS HC A08 CSCL 22B

This bibliography lists 460 reports, articles, and other documents introduced into the NASA scientific and technical information system between January 1, 1968 and December 31, 1978. Its purpose is to provide helpful information to the researcher, manager, and designer in technology development and mission design in the area of the Large Space Systems Technology Program. Subject matter is grouped according to systems, interactive analysis and design, structural concepts, control systems, electronics, advanced materials, assembly concepts, propulsion, and flight experiments. Author

N79-21109*# National Aeronautics and Space Administration, Washington, D. C.
FLTSATCOM-B LAUNCH
John F. Yardley 18 Apr. 1979 22 p
(NASA-TM-79941; M-491-202-79-02) Avail: NTIS HC A02/MF A01 CSCL 22A

The prelaunch mission operation report of the Fleet Satellite Communications System (FLTSATCOM-B) spacecraft is presented. The orbit requirements, mission profiles, parking orbit, and transfer orbit for the FLTSATCOM-B spacecraft are described. M.M.M.

N79-21110*# Future Systems, Inc., Gaithersburg, Md.
LARGE COMMUNICATIONS PLATFORMS VERSUS SMALLER SATELLITES Final Report
Feb. 1979 234 p refs
(Contract NASw-3212)
(NASA-CR-158458; FSI-221) Avail: NTIS HC A11/MF A01 CSCL 22B

Communications systems using large platforms are compared with systems using conventional satellites. Systems models were generated and compared for U.S. domestic application and for 1 INTELSAT's international and domestic transponder lease application. Technology advances were assumed the platforms and the evolution of conventional satellites. S.E.S.

N79-21111# Ballistic Research Labs., Aberdeen Proving Ground, Md. Ballistics Research Lab.
ANGULAR MOTION SPINNING ALMOST SYMMETRIC MISSILES Final Report
Charles H. Murphy Nov. 1978 50 p refs
(AD-A063538; AD-E430157; ARBRL-TR-02121) Avail: NTIS HC A03/MF A01 CSCL 20/4

An almost symmetric missile is a missile whose zero-spin pitch and yaw frequencies are 'nearly' equal. The angular motion of a spinning almost symmetric missile can be described by five rotating modal vectors. Two of these vectors vanish when the frequencies are equal. Good approximations for modal frequencies and amplitudes are derived for the special cases of near zero spin and spins near pitch or yaw resonance as well as for spins away from these special regions. Author (GRA)

N79-21112# Hughes Research Labs., Malibu, Calif.
ROCKET MODEL SATELLITE POSITIVE ION BEAM SYSTEM Final Report, 1 Jul. 1976 - 1 Oct. 1977
T. Masek Oct. 1978 170 p refs
(Contract F19628-76-C-0272)
(AD-A063253; AFGL-TR-78-0179) Avail: NTIS HC A08/MF A01 CSCL 20/3

The Rocket Model (RM) Satellite Positive Ion Beam System (SPIBS) instrument was built to be one experiment in an Astrobee F Rocket scientific payload. The purpose of the rocket experiment was to obtain electrostatic charging data in the altitude range of 100 to 300 km. SPIBS provides a controllable means of ejecting a positive xenon ion beam or a neutralized ion beam at ion energies of 1 or 2 keV. Rocket flight test results showed that surface potentials of several hundred volts were achieved by ion ejection and that charging varied as a function of altitude. Although the RM-SPIBS was built for its own distinct purpose, an equally important function of the rocket flight was the evaluation of the SPIBS design. The SPIBS primary development effort was in fact carried out under the main program. The RM-SPIBS instrument was built to a quality level similar to the SPIBS engineering model (EM) instrument. GRA

N79-21113# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LIMITING POINT-SOURCE DETECTION CAPABILITIES OF TWO-DIMENSIONAL, SCANNED, OPTICAL DETECTOR ARRAYS IN CONSTANT FALSE-ALARM SYSTEMS
Robert Weber 3 Nov. 1978 29 p refs
(Contract F19628-78-C-0002)
(AD-A063751; TN-1978-10; ESD-TR-78-281) Avail: NTIS

HC A03/MF A01 CSCL 17/8

An optical point-source detection system in which a constant number of false alarms is allowed per data set (exposure time) based on the post-detection processing, is considered. The detector is a two-dimensional scanned array. With a single threshold determined solely by the allowed false alarms, that minimum average signal necessary to satisfy a given requirement on the probability of detection for various background (sky, in this instance) and electronic noise levels is determined. This development leads to a critical signal-noise expression at the first photon to charge-carrier conversion surface which is not an explicit function of the standard deviation of the signal. This expression is used to compare the detection performances of noise-free and of noisy detector arrays using the parameters of typical, ground-based, satellite surveillance systems. Author (GRA)

N79-21114# Sundstrand Data Control, Inc., Redmond, Wash.
LANCE TECHNICAL IMPROVEMENT PROGRAM Final Technical Report, Aug. 1977 - Jul. 1978
Richard A. Hanson 21 Jul. 1978 24 p
(Contract DAAK40-77-C-0148)
(AD-A063609) Avail: NTIS HC A02/MF A01 CSCL 17/7

The Lance TIP program was initiated as a prequalification evaluation of the Sundstrand accelerometer to determine its availability as a second source to the MIS 13227C requirements for the Lance missile. Improvements in the Sundstrand accelerometer design, incorporating the basic Q-Flex sensor were required in several areas to establish a low cost, dependable volume production capability for the Lance application. It is concluded that the Lance TIP program was completely and extremely successful. Despite unforeseen electronics problems, the hardware was built and formal verification tests were completed on schedule. This success allowed the state of the formal production qualification to make possible timely flight qualification for the Lance missile. GRA

N79-21115# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
USE OF DRAG MEASUREMENTS TO IMPROVE SHORT-TERM ORBIT PREDICTION Interim Report
Barbara K. Ching and David R. Hickman Dec. 1978 87 p refs
(Contract F04701-78-C-0079)
(AD-A063398; TR-0079(4960-04)-1; SAMSO-TR-78-144) Avail: NTIS HC A05/MF A01 CSCL 22/2

The improvement in short-term orbit prediction that results from the use of real-time drag measurements to determine the initial vehicle vector was studied using orbit simulation calculations. Realistic time-dependent behavior of the drag force was provided by the use of calorimeter data from an actual flight. The study was limited to a specific class of low-altitude orbits and to average conditions of magnetic activity. In five samples of calorimeter data, RMS errors in a 3-rev predict span were reduced by factors $<$ or $=$ 2 and $<$ or $=$ 3 in the radial and intrack components, respectively, caused solely by the improvement in the initial vector of the predict span. Errors that remain despite the utilization of a near-perfect starting vector could only be caused by improperly modeled drag effects. Because such effects are likely to be the limiting factor in prediction accuracy, improved capability of density prediction will be necessary to meet stringent mission requirements. Until reliable density forecasting capability becomes a reality, the 'persistence' feature of the atmosphere can be exploited to improve short-term prediction. In four out of five cases studied, prediction based on the last orbit of drag data in the fit span reduced errors significantly in the predict span. Author (GRA)

N79-21116# Northeastern Univ., Boston, Mass. Electronics Research Lab.
MOTOR DRIVEN SYSTEM FOR SOUNDING ROCKET PAYLOADS Interim Report
Richard L. Morin Oct. 1978 27 p refs
(Contract F19628-76-C-0152)
(AD-A063254; AFGL-TR-78-0252; SR-2) Avail: NTIS HC A03/MF A01 CSCL 22/2

Presented is a summary of the design and development of a motor drive system, under Contract Number F19628-76-C- 0152. The primary objective is a mechanism and control system to meet the requirements of the Multi Spectral Measurements Program. In general, the concepts are applicable to future sounding rocket payload motor drive systems. Author (GRA)

N79-21467*# McDonald Observatory, Austin, Tex.
MOBILE SATELLITE RANGING
Eric C. Silverberg *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 41-46 refs (For primary document see N79-21460 12-42)
(Contract NASw-2974)
Avail: NTIS HC A16/MF A01 CSCL 22D

N79-21490*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
A DRAG-FREE LO-LO SATELLITE SYSTEM FOR IMPROVED GRAVITY FIELD MEASUREMENTS
Robert E. Fischell and Vincent L. Pisacane *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 213-219 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N79-21117*# National Aeronautics and Space Administration, Washington, D. C.
NASA FACTS: AN EDUCATIONAL PUBLICATION OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. SPACE SHUTTLE
[1979] 8 p
(NASA-TM-79955; NF-79/6-77) Avail: NTIS MF A01; SOD HC CSCL 22B

The versatility of space shuttle, its heat shieldings, principal components, and facilities for various operations are described as well as the accomodations for the spacecrew and experiments. The capabilities of an improved space suit and a personal rescue enclosure containing life support and communication systems are highlighted. A typical mission is described. A.R.H.

N79-21118*# Rockwell International Corp., Los Angeles, Calif.
ADHESIVES FOR BONDING RSI TILE TO GrPI STRUCTURE FOR ADVANCED SPACE TRANSPORTATION SYSTEMS Final Report
K. E. Smith, C. L. Hamermesh, and P. A. Hogenson Apr. 1979 120 p refs
(Contract NAS1-15152)
(NASA-CR-159000) Avail: NTIS HC A06/MF A01 CSCL 22B

A system was developed for bonding RSI tiles to a graphite/polymide composite substrate which would withstand the full range of environmental conditions. The bonding system, designated RA59, consists of a mixture of glass (sesquisiloxane) resin in RTV 560 silicone. A significant number of data points for the RA59 are in the 65-psi failure range both when tested, and after exposure to 700 F. This is over two times the best shear and tensile values obtained with RV60 at this temperature. It is concluded that with a thorough understanding of the critical parameters involved, the higher values should be obtained consistently with the RA59. This is of particular significance if higher strength tiles were to be used in a hard-bonded configuration. M.M.M.

N79-21119*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NEAR-FIELD SONIC-BOOM PRESSURE SIGNATURES FOR THE SPACE SHUTTLE LAUNCH AND ORBITER VEHICLES AT MACH 6
George C. Ashby, Jr. Apr. 1979 36 p refs
(NASA-TP-1405; L-12638) Avail: NTIS HC A03/MF A01 CSCL 20A

Static-pressure signatures parallel to the flight path of the launch and entry configurations of the space shuttle were

measured. The launch configurations, consisting of an equivalent body of revolution (representing the orbiter and external fuel tank) with a solid exhaust gas plume attached, was tested at an angle of attack of 0 deg. The entry configuration (orbiter only) was tested over an angle-of-attack range from 10 deg to 40 deg. Calculated pressure signatures were in good agreement with measured signatures for both configurations. S.E.S.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N79-21120*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL ANOMALIES OF THE TRANSMITTER EXPERIMENT PACKAGE ON THE COMMUNICATIONS TECHNOLOGY SATELLITE
Robert E. Alexovich and Arthur N. Curren Apr. 1979 113 p refs
(NASA-TP-1410; E-9735) Avail: NTIS HC A06/MF A01 CSCL 17B

The causes of four temporary thermal-control-system malfunctions that gave rise to unexpected temperature excursions in the 12-gigahertz, 200-watt transmitter experiment package (TEP) on the Communications Technology Satellite were investigated. The TEP consists of a nominal 200-watt output stage tube (OST), a supporting power-processing system (PPS), and a variable-conductance heat-pipe system (VCHPS). The VCHPS, which uses three heat pipes to conduct heat from the body of the OST to a radiator fin, was designed to maintain the TEP at safe operating temperatures at all operating conditions. On four occasions during 1977, all near the spring and fall equinoxes, the OST body temperature and related temperatures displayed sudden, rapid, and unexpected rises above normal levels while the TEP was operating at essentially constant, normal conditions. The temperature excursions were terminated without TEP damage by reducing the radio frequency (RF) output power of the OST. Between the anomalies and since the fourth, the thermal control system has apparently functioned as designed. The results indicate the most probable cause of the temperature anomalies is depriming of the arteries in the variable-conductance heat pipes. A mode was identified in which the TEP, as presently configured, may operate with stable temperatures and with minimum change in performance level. S.E.S.

N79-21121*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ONBOARD NAVIGATION SYSTEMS CHARACTERISTICS
Mar. 1979 310 p refs Supersedes MSC-07222
(NASA-TM-79944; JSC-14675; MSC-07222) Avail: NTIS HC A14/MF A01 CSCL 17G

The space shuttle onboard navigation systems characteristics are described. A standard source of equations and numerical data for use in error analyses and mission simulations related to space shuttle development is reported. The sensor characteristics described are used for shuttle onboard navigation performance assessment. The use of complete models in the studies depend on the analyses to be performed, the capabilities of the computer programs, and the availability of computer resources. Author

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

No abstracts in this category.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N79-21122*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SCHEMATIC DISPLAYS FOR THE SPACE SHUTTLE ORBITER MULTIFUNCTION CATHODE-RAY-TUBE DISPLAY SYSTEM
William Weiss Mar. 1979 337 p refs
(NASA-TM-58206; JSC-13853) Avail: NTIS HC A15/MF A01 CSCL 09C

A standardized procedure for developing cathode ray tube displayed schematic diagrams. The displaying of Spacelab information on the space shuttle orbiter multifunction cathode ray tube display system is used to illustrate this procedure. Schematic displays with the equivalent tabular displays are compared. A.R.H.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N79-21123* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF MAKING A ROCKET NOZZLE Patent
Daniel H. Campbell, inventor (to NASA) (United Technologies Corp., East Hartford, Conn.) Issued 23 Dec. 1969 4 p Filed 14 Sep. 1966 Sponsored by NASA
(NASA-Case-XMF-06884-1; US-Patent-3,485,290; US-Patent-Appl-SN-579300; US-Patent-Class-164-105) Avail: US Patent and Trademark Office CSCL 21H

A method is described for forming the interior of a nozzle having uneven walls so that a throat of smooth converging and diverging sides is provided for passing flow. A metallic insert material is placed within the flow passageway adjacent to the area where the sharper throat constriction is to be formed, so that the material will flow through the inlet into the throat space when liquefied.

Official Gazette of the U.S. Patent and Trademark Office

N79-21124* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLUID THRUST CONTROL SYSTEM Patent
William L. Howell (United Technologies Corp., Hartford, Conn.), Harvey B. Jansen (United Technologies Corp., Hartford, Conn.), and Eugene N. Lehmann, inventors (to NASA) (United Technologies Corp., Hartford, Conn.) Issued 2 Jul. 1968 7 p Filed 8 Sep. 1966 Sponsored by NASA
(NASA-Case XMF-05964-1; US-Patent-3,390,528;

US-Patent-Appl-SN-578397; US-Patent-Class-60-243) Avail: US Patent and Trademark Office CSCL 21H

A pure fluid thrust control system is described for a pump-fed, regeneratively cooled liquid propellant rocket engine. A proportional fluid amplifier and a bistable fluid amplifier control overshoot in the starting of the engine and take it to a predetermined thrust. An ejector type pump is provided in the line between the liquid hydrogen rocket nozzle heat exchanger and the turbine driving the fuel pump to aid in bringing the fluid at this point back into the regular system when it is not bypassed. The thrust control system is intended to function in environments too severe for mechanical controls.

Official Gazette of the U.S. Patent and Trademark Office

N79-21126* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ROCKET INJECTOR HEAD Patent

Charles W. Green, Jr., inventor (to NASA) (United Technologies Corp., Hartford, Conn.) Issued 20 Aug. 1968 7 p Filed 14 Sep. 1966 Sponsored by NASA

(NASA-Case-XMF-04592-1; NASA-Case-XMF-04593-1; US-Patent-3,397,537; US-Patent-Appl-SN-579376; US-Patent-Class-60-39.74) Avail: US Patent and Trademark Office CSCL 21H

A high number of liquid oxygen and gaseous hydrogen orifices per unit area are provided in an injector head designed to give intimate mixing and more thorough combustion. The injector head comprises a main body portion, a cooperating plate member as a flow chamber for one propellant, a cooperating manifold portion for the second propellant, and an annular end plate for enclosing an annular propellant groove formed around the outer edge of the body. All the openings for one propellant are located at the same angle with respect to a radial plane to permit a short combustion chamber. A.R.H.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N79-21128* Wayne State Univ., Detroit, Mich.

SULFOXIMINE-MEDIATED SYNTHESES OF OPTICALLY ACTIVE ALCOHOLS Ph.D. Thesis

Charles John Stark, Jr. 1978 4 p

Avail: Univ. Microfilms Order No. 7908966

Several routes are described for the production of optically active secondary and tertiary alcohols. In all cases, the asymmetry emanates from the use of (+)-(S)-N,S-dimethyl-S-phenylsulfoximine (1) at some point in the variation of the diastereomers. One route relies upon the separation of the diastereomers produced from the condensation of (+)-(S)-(N-methylphenylsulfonimidoyl) methyllithium with prochiral aldehydes and ketones. Subsequent carbon-sulfur bond cleavage of the separated diastereomeric beta-hydroxysulfoximines yields optically active alcohols. Alternatively, beta-hydroxysulfoximines were produced from the reduction of chiral beta-ketosulfoximines. The reductions were most successfully achieved with diborane generated externally and bubbled into a toluene solution of the ketone at -78 C. Optically active alcohols were also produced from prochiral ketones by reduction with diborane or lithium aluminum hydride complexes of resolved diastereomers of beta-hydroxysulfoximines. Dissert. Abstr.

N79-21127 Saint Louis Univ., Mo.

ELECTRON SPIN RESONANCE STUDIES OF SOME ORGANIC FREE RADICALS Ph.D. Thesis

John Stephen Jones 1978 61 p

Avail: Univ. Microfilms Order No. 7908285

The free radical systems were studied primarily through the electrochemical generation of the radical, and through the chemical reduction by alkali metals. The two radical systems were the subject of much less work are nitrobenzene and 9, 10-anthraquinone. Unsuccessful attempts were made to examine the homogeneous electron transfer rates using chemically generated nitrobenzenide radicals. The anthraquinone solvation in ethanol and acetonitrile is reported. The radical is preferentially solvated by the ethanol. The spectrum of anthraquinone radical is reported. There is evidence for the presence of a diamagnetic dimer of the anthraquinone in acetonitrile. This dimer is in equilibrium with the loose ion pair. Dissert. Abstr.

N79-21128*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THREE METHODS FOR IN SITU CROSS-LINKING OF POLYVINYL ALCOHOL FILMS FOR APPLICATION AS ION-CONDUCTING MEMBRANES IN POTASSIUM HYDROXIDE ELECTROLYTE

Warren H. Philipp and Li-Chen Hsu Apr. 1979 18 p refs (NASA-TP-1407; E-9778) Avail: NTIS HC A02/MF A01 CSCL 07D

Three methods of in situ cross-linking polyvinyl alcohol films are presented. They are: (1) acetalization with a dialdehyde such as glutaraldehyde, (2) acetalization with aldehyde groups formed by selective oxidative cleaving of the few percent of 1,2 diol units present in polyvinyl alcohol, and (3) cross-linking by hydrogen abstraction by reaction with hydrogen atoms and hydroxyl radicals from irradiated water. For the third method, improvement in film conductivity in KOH solution at the expense of mechanical strength is obtained by the presence of polyacrylic acid in the polyvinyl alcohol films. Resistivities in 45 percent KOH are given for in situ cross-linked films prepared by each of the three methods. Author

N79-21129# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

CARBENE CHEMISTRY. 1: STEREOCHEMICAL INTEGRITY AT C SUB ALPHA IN KETONE TOSYLYDRAZONES. 2: HYDROGEN MIGRATION TOSYLHCARBENA-6, 6-DIMETHYLNORBORNANE M.S. Thesis

John Robert Balyeat Feb. 1978 74 p refs (AD-A063019; AFIT-CI-79-48T) Avail: NTIS HC A04/MF A01 CSCL 07/3

The tosylhydrazones of exo-3-deuteriocamphor and 2-deuterio-2-4-dimethyl-3-pentanone were treated with N-bromosuccinimide (NBS) and pyruvic acid to regenerate the parent ketones. The ketones from the pyruvic acid cleavage show a significant loss of deuterium. The ketones from the NBS cleavage show no loss of deuterium, indicating that stereochemical integrity at C sub alpha is maintained during the NBS cleavage. Author (GRA)

24 COMPOSITE MATERIALS

Includes laminates.

N79-21130 Northwestern Univ., Evanston, Ill.

DETERMINATION OF DYNAMIC CHARACTERISTICS OF ELASTIC COMPOSITE STRUCTURES Ph.D. Thesis

Kuo-Wei Lang 1978 157 p

Avail: Univ. Microfilms Order No. 7907903

A new quotient method, based on general variational principles which allow independent variations of various field quantities, is used to analyze the dynamic characteristics of structural components, whose material properties or dimensions vary sharply or discontinuously. Cases of heat conduction and harmonic waves in layered composites vibration and buckling of composite beams and strip-plates,and vibration of non-uniform rotor blades are studied. The eigenvalues and the corresponding eigenfunctions are estimated by the method of new quotient; the results are compared with those obtained by the usual Rayleigh energy method, the exact solution (or available experimental data), and other approximate methods. The corresponding bounds on eigenvalues are constructed for certain cases and the good accuracy obtained by the application of the new quotient method is demonstrated by means of numerical examples. Dissert. Abstr.

N79-21131 State Univ. of New York at Stony Brook.

SPINODAL DECOMPOSITION AND PRECIPITATION IN RAPIDLY-QUENCHED OXIDES Ph.D. Thesis

Carol Maryanne Fredericks Jantzen 1978 543 p

Avail: Univ. Microfilms Order No. 7908400

A modified Duwez splat gun was combined with a continuous

wave 400 watt CO2 laser to successfully quench many unary and binary oxides. In addition, roller-quenching of Al2O3-SiO2 and water-quenching of KAlSi3O8-NaAlSi3O8 mixtures were employed. Furnace quenching techniques were used for MgO3. 5Al2O3, and solid quenching for TiO2-SnO2 and CoO-NiO. Phase decomposition by a spinodal mode is predicted for MgAl2O4- Al2O3, MgO-MgAl2O4, MgO-COO, MgO-CaO and possibly COO-NiO. The experiments demonstrate, that spinodal decomposition is, indeed, operative in Al2O3-SiO and may be operative in KAlSi3O8-NaAlSi3O8. Experimentally, early stage precipitation of an Al2O3-rich phase is demonstrated for MgO(3.5Al2O3). Dissert. Abstr.

N79-21132# Royal Aircraft Establishment, Farnborough (England).
THE FATIGUE STRENGTH OF PLAIN NOTCHED AND JOINTED SPECIMENS OF CARBON FIBRE COMPOSITES
D. Schuetz, J. J. Gerharz, and E. Alschweig Dec. 1978 23 p refs Transl. into ENGLISH of "Zur Schwingfestigkeit von Ungekerbten, Gekerbten und Gefuegten Proben aus den Faserverbundwerkstoff CFK", Rept-78-188 Lab. fuer Betriebsfestigkeit, Darmstadt, West Ger. Presented at DGLR Symp., Darmstadt, West Ger., 22 Sep. 1978
(RAE-Lib-Trans-2000; BR67276) Avail: NTIS HC A02/MF A01

Static and fatigue testing in tension and compression was carried out on carbon fiber/epoxy material of angle-ply lay up in the form of plain and notched specimens and bolted joints. The differences observed between the types of specimen as regards stress-strain behavior, tensile and compressive strength and performance and modes of failure under fatigue loading are discussed. Stress concentration has an appreciable effect on static and short term fatigue strength but little effect in long term fatigue. The performance of the open hole specimen was modified by fitting a clamped, oversize bolt. Appreciable effects were observed from load transfer and secondary bending in the joint specimens. In general the scatter in static and fatigue strength was comparable with that for similar features in metals. When the plain material was loaded transversely instead of longitudinally, the static and fatigue strengths were lower by a factor of about 3. Author

N79-21133*# Boeing Commercial Airplane Co., Seattle, Wash. Boeing Materials Technology.
DEVELOPMENT OF LIGHTWEIGHT, FIRE-RETARDANT, LOW-SMOKE, HIGH-STRENGTH, THERMALLY STABLE AIRCRAFT FLOOR PANELING Final Report
R. A. Anderson, R. M. Ougland, and R. J. Karch Jun. 1978 60 p
(Contract NAS9-15062)
(NASA-CR-160138; D6-48571-TN) Avail: NTIS HC A04/MF A01 CSCL 11D

Extensive fire resistance and mechanical property tests were conducted on sandwich configurations composed of resin-fiberglass laminates bonded with adhesive to Nomex honeycomb and foam core. The test results were used to select a combination of materials that would improve the fire safety of the airplane without sacrificing mechanical performance of the aircraft floor panels. A test panel is being service evaluated in a commercial aircraft. A.R.H.

N79-21134*# Rensselaer Polytechnic Inst., Troy, N. Y.
IMPROVED HIGH MODULUS CARBON FIBERS
G. S. Ansell, S. H. Chen, R. J. Diffendorf, C. M. Kim, C. W. LeMaistre, C. E. Lyman, T. H. Shen, and J. J-H. Wang Apr. 1979 81 p
(Grant NsG-1510)
(NASA-CR-158479) Avail: NTIS HC A05/MF A01 CSCL 11D

Carbon fibers which are electrically insulating but still maintain the mechanical properties of the original carbon fibers were investigated. Three approaches were taken to increase the electrical resistance of carbon fibers: (1) boron nitride (BN) coatings; (2) doping of carbon fibers to alter their electrical properties; and (3) low temperature final heat treatment. The structure of carbon fibers and its effect upon properties was also studied. Results are presented. J.M.S.

N79-21135# Hercules, Inc., Radford, Va.
USING GRAPHITE FILAMENT COMPOSITIONS AS A DIE MATERIAL Final Report, Jun. 1975 - Mar. 1978
R. J. Styne Oct. 1978 86 p
(Contract DAAA09-77-C-4007)
(AD-A063540; AD-E400225) Avail: NTIS HC A05/MF A01 CSCL 13/9

Technological advances in graphite filament-reinforced compounds have provided a material adaptable for use in propellant extrusion operations. Two graphite composite formulations were selected for evaluation. Each contained 30% graphite and 15% Teflon, with the remaining constituent being nylon and polyphenylene sulfide (PPS), respectively. Dies were fabricated from the above materials and were compared with Delrin dies, currently used in propellant manufacturing operations, to establish wear and failure characteristics. An additional die fabricated from stainless steel and coated with Teflon was also evaluated. The stainless steel-Teflon coated die and the graphite composite formulation containing PPS were found to be superior to the other dies. An economic evaluation indicated that the graphite die would be more desirable for extended production use.
Author (GRA)

N79-21136# AiResearch Mfg. Co., Torrance, Calif.
HIGH-TEMPERATURE MECHANICAL PROPERTIES OF SINTERED ALPHA SILICON CARBIDE Progress Report, 13 Oct 1977 - 13 Oct. 1978
David M. Kotchick 18 Dec. 1978 58 p refs
(Contract N00014-76-C-0249)
(AD-A063569; AiResearch-78-15576) Avail: NTIS HC A04/MF A01 CSCL 11/2

This report summarizes the results of the third year of a continuing research program on the various grades of silicon carbide of interest for naval applications. This program has thus been designated as ONR-3. The ONR-3 program was initiated to further explore the limitations of SASC in oxidizing and marine (salt-bearing) environments as a function of reliability particularly for use in high temperature heat exchangers and turbines. The program was also formulated to generate stressed-lifetime data using differential strain rate techniques. These data can be generated by stress rupture testing, but it is a time consuming procedure. If there is little or no crack growth for the particular testing environment during stress rupture testing, the time to failure is either very long or occurs within a very narrow stress interval. To minimize the need to collect stress rupture data, the same information can be generated from other types of tests. This approach is based on the fracture mechanics theory that fatigue failure of ceramics occurs from stress-dependent growth of preexisting flaws to dimensions critical for spontaneous crack propagation. Furthermore, using expressions developed for time-to-failure predictions, the life expectancy of parts under a particular cyclic loading schedule can be predicted from static (stress rupture) or dynamic testing experiments. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N79-21137 Engineering Sciences Data Unit, London (England).
VISCOSITY OF WATER AND STEAM
Nov. 1978 20 p
(ESDU-78040; ISBN-0-85679-243-6) For information on availability of series, subseries, or individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC E99

This item presents equations and values in SI units for the dynamic viscosity of water and steam for temperatures between 0 and 800C and for pressure between 0 1000 bar. The data are presented in the form of Tables generated by computer. The tabulated values have been calculated at specific values of temperature and pressure from a single representative equation

for the viscosity of water substances a function of temperature and density. ESDU

N79-21138 Engineering Sciences Data Unit, London (England).
VAPOUR PRESSURES AND CRITICAL POINTS OF LIQUIDS. 13: ORGANIC SULPHUR COMPOUNDS
1978 45 p
(ESDU-78034; ISBN-0-85679-238-1) For information on availability of series, subseries, or individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC E99

Saturated vapor pressures of organic sulphur compounds are presented. Tabular values vary from just under 0.01 mmHg to the critical pressure, thus considerably extending the range of values obtainable from Antoine equations available for some of the compounds. All quantities are expressed in SI units. The procedures used to derive the values of vapor pressure are in presented explanation of the Tables, and a rapid interpolation procedure for use with the Tables is given. The values of vapor pressure given were obtained by evaluation for each compound, an equation in the form of a series of Chebyshev polynomials fitted to the data that had been selected and weighted in accordance with a critical assessment of all the data. ESDU

N79-21139 California Univ., Los Angeles.
TRIPLET-SPIN LABELS IN STRUCTURAL AND DYNAMIC STUDIES OF MIXED AROMATIC SOLIDS Ph.D. Thesis
William Murray Pitts 1978 331 p
Avail: Univ. Microfilms Order No. 7907679

The technique of low field Zeeman spectroscopy was used to differentiate a direct intersystem crossing (ISC) from the lowest excited singlet (S1) to the lowest triplet (Tx) from one in which ISC occurs first to a triplet intermediate in energy between S1 and T1 followed by internal conversion to T1. For the first time the method was applied to aromatic hydrocarbons and their derivatives. For naphthalene, the experimental results was also consistent with a direct ISC, but no definite conclusions concerning the pathway can be made. The resonant long range interaction of a triplet spin system and a doublet spin system isolated in the same crystal was investigated. Such a process was called cross relaxation. The effects of cross relaxation on the phosphorescence intensity of s-tetrachlorobenzene are described and rate equations are developed which model the dynamics of the interaction reflected in the observed time dependent behavior of the phosphorescence intensity.
Dissert. Abstr.

N79-21140 Michigan State Univ., East Lansing.
SPECTROSCOPIC STUDIES OF POTASSIUM SALT SOLVATION AND COMPLEXATION IN VARIOUS SOLVENTS Ph.D. Thesis
Jeny-Shang Shih 1978 207 p
Avail: Univ. Microfilms Order No. 7907401

Potassium-39 and carbon-13 NMR measurements were applied as a sensitive probes in the studies of solvation and complexation of potassium salts in nonaqueous solvents. In most cases, the chemical shifts of K39 were dependent on the concentration of K(+)ion, which is indicative of the formation of contact ion pairs. The contact ion pairing formation was found to be dependent on the dielectric constant and also on the donicity of the solvents. Ion-solvent interaction was also studied by the extrapolation of the chemical shift to infinitely dilute concentration. In general, a correlation was observed between the K39 infinite dilute chemical shift with the Gutmann donor numbers of the solvents. A linear relation between the infinite dilution chemical shifts and the atomic numbers of alkali metals was found in some solvents such as acetonitrile, dimethylsulfoxide and nitromethane. Dissert. Abstr.

N79-21141 Wisconsin Univ. - Madison.
ON THE APPLICATION OF HARTREE-FOCK AND CONFIGURATION INTERACTION CALCULATIONS TO TRANSITION METAL NITROSYLS Ph.D. Thesis
James Robert Jensen 1978 290 p
Avail: Univ. Microfilms Order No. 7823740

The usefulness of the Hartree-Fock method as applied to transition metal nitrosyls was investigated by the application of configuration interaction (CI) calculations to the molecular fragments CoNO and MnNO and to the molecules Co(CO)3 NO and Mn(CO)4 NO. It was found that CI is necessary to a proper description of these molecules due to the importance of configurations which result from the excitation of electrons from the metal nitrosyl pi bond to the pi antibond. The usefulness of a single configuration is further challenged by the fact that the best single configuration for some molecules is not the configuration with the lowest energy. The interpretation of CI wavefunction was aided by the application of the extended Koopmans' Theorem (EKT). This allowed the direct calculation of ionization potentials from ground state CI wavefunction. Dissert. Abstr.

N79-21142 Clark Univ., Worcester, Mass.
SOLUBILITIES OF SOME PERFLUOROCARBON GASES IN WATER, HEAVY WATER AND ETHANOL-WATER MIXTURES AND OF METHANE IN WATER AND AQUEOUS SOLUTIONS OF TRIETHYLENEDIAMINE Ph.D. Thesis
John Anthony Muccitelli 1978 371 p
Avail: Univ. Microfilms Order No. 7907001

The solubilities of CF4, CeF6 and c-C4F8 were measured in water at 5 deg. intervals from 5 to 30 C with an experimental precision of ca. 1% using the apparatus of Ben-Naim and Baer as modified by Wen and Hung. C3F8 solubilities were measured from 5 to 15 C. Thermodynamic functions for the dissolution process based on the molar concentration (number density) scale were calculated and the free energies of solution were observed to exhibit the minima and maxima as a function of XEOH which are typical for apolar gases in ethanol-water mixtures. The results were interpreted in terms of the model for hydrophobic interaction proposed by Ben-Naim. The solubilities CH4 were measured in water and aqueous solutions containing triethylenediamine, triethylenediamine hydrochloride and CHI at several concentrations. Dissert. Abstr.

N79-21143 Texas A&M Univ., College Station.
INVESTIGATION OF THE O(-)2n + O2 EQUALS O(-)2n+2 EQUILIBRIA FROM 77 DEG K TO 373 DEG K Ph.D. Thesis
William Herman Ulbricht, Jr. 1978 122 p
Avail: Univ. Microfilms Order No. 7909244

The ion-molecule reactions O2 + O(-)2N = O(-)2N+2, n = 1 - 5, were studied in the pressure range of 1.5 to 12.0 torr and a temperature range of 77 to 373 K. The reactions occurred in a stream of partially ionized oxygen gas. Ions were sampled with a time-of-flight mass spectrometer and the ionization chamber pressure was measured with a calibrated mechanical manometer. Equilibrium constants were determined from the relative concentrations of detected negative oxygen ions adjacent in mass and the ionization chamber pressure; delta H sub T and delta S sub T were calculated from the temperature variation of the equilibrium constants for each reaction (n). Two vibrational models were used to estimate the vibrational frequencies from the entropy data. These frequencies were then used to correct delta H sub T to 0 K for both models to obtain bond energies for each cluster. Dissert. Abstr.

N79-21144 State Univ. of New York at Stony Brook.
MULTIPHOTON IONIZATION SPECTROSCOPY OF NITRIC OXIDE Ph.D. Thesis
David Steven Zakheim 1978 222 p refs
Avail: Univ. Microfilms Order No. 7907571

The multiphoton ionization spectrum of nitric oxide, with its exhaustively studied one-photon spectrum and moderately low ionization potential, was studied with the hope of elucidating the dynamical nature of molecular multiphoton phenomena. The relative intensities of the two- and three-photon resonances support the notion that a kinetic rate equation description provides a basic framework for the interpretation of multiphoton ionization spectra initiated by a pulsed, multimode dye laser. A kinetic model, appropriate for the collisionless, supersonic molecular jet experiments, is proposed. Qualitative features of the kinetic description are explored and model calculations, including saturation effects, are presented. Qualitative agreement between the observed low-temperature spectra and kinetic calculations, using theoretical absorption and ionization cross-sections, is found. Dissert. Abstr.

N79-21145 Oklahoma Univ., Norman.
EVALUATION OF THE SUB-SUPEREQUIVALENCE METHOD

OF ISOTOPE DILUTION ANALYSIS USING ZINC-DITHIZONE AS A TEST CASE Ph.D. Thesis
Darrel Ray Cornell 1978 255 p
Avail: Univ. Microfilms Order No. 7908819

The feasibility, validity, reproducibility, and sensitivity of the subsuperequivalence modification to isotope dilution analysis is explored. The sample to be analyzed is labeled with the appropriate isotope and the solution divided into two series. Experimental conditions were then broken down into four possible cases, depending upon whether the dithizone was either greater than or less than the zinc in the two series. When the dithizone is substoichiometric in terms of zinc (Cases 2A and 2B), the method proved effective in determining the zinc concentration of a solution. Results are also encouraging for superstoichiometric quantities of dithizone (Case 1B), provided that such quantities did not becom excessive. The results also indicated that primary dithizonates are present when the ratio of zinc to dithizone is high but that with large amounts of dithizone, secondary dithizonates predominate. Dissert. Abstr.

N79-21146 Duke Univ., Durham, N. C.
MIXED RETENTION MECHANISMS IN THE CHROMATOGRAPHIC SEPARATION OF ENANTIOMERS ON OPTICALLY ACTIVE MESOPHASES Ph.D. Thesis
Lance Jay Deutsch 1978 188 p
Avail: Univ. Microfilms Order No. 7906972

The direct separation of enantiomers by gas-liquid chromatography was limited by a lack of suitable stationary phases. Two compounds, carbonyl-bis(L-valine isopropyl ester) and carbonyl-bis (L-leucine isopropyl ester), were found to provide excellent separation of some enantiomeric amide solutes. In addition, these stationary phases exhibit liquid crystalline behavior. The chromatographic separation of enantiomers on the mesophase was found to be greater than that observed on the isotropic liquid. One possible explanation for these observations was that more than one mechanism contributed to retention. In the case of a polar, liquid crystalline stationary phase, such as carbonyl-bis (L-valine isopropyl ester), adsorption of the solute at the gas-liquid interface must be considered as a possible retention mechanism.
Dissert. Abstr.

N79-21147 Michigan Univ., Ann Arbor.
SPECTROSCOPIC STUDIES OF ALKALI METAL COMPLEXES IN NON-AQUEOUS MEDIA Ph.D. Thesis
Adamantia Rokofilou Hourdakis 1978 150 p
Avail: Univ. Microfilms Order No. 7907347

The complexation reaction of the dilactam of cryptand C222 with lithium, sodium and cesium ions in water and in several nonaqueous solvents was studied by using 7 Li, 23 Na, 133 Cs and 13 C NMR technique and far infrared measurements. Alkali metal ion chemical shifts were determined as a function of dilactam/metal ion mole ratios. There is no indication of a Li(+)-C222D complex formed in water, dimethyl sulfoxide, dimethylformamide and methanol while in formamide and acetone there is indication of a rather weak complex. Formation constants of lithium-C222D complexes were determined in acetonitrile, tetrahydrofuran, pyridine and nitromethane. Dissert. Abstr.

N79-21148 Michigan State Univ., East Lansing.
MICROCOMPUTER-CONTROLLED STOPPED-FLOW CLINICAL ANALYZER IN WHICH IMMOBILIZED ENZYME REACTION LOOPS ARE USED Ph.D. Thesis
Martin David Joseph 1978 209 p
Avail: Univ. Microfilms Order No. 7907354

A microcomputer-controlled stopped-flow clinical analyzer was developed for application in clinical analysis. The analyzer uses an immobilized enzyme to catalyze the conversion of a specific analyte to a specific product. The concentration of the product is determined spectrophotometrically in a follow-up indicator reaction, which takes place in the observation cell of the stopped-flow module. The separation of these two reactions permits the selection of optimum conditions for each, and also the use of either a reaction-rate method or an equilibrium method to monitor each reaction. The kinetics of the immobilized enzymes were studied. The Michaelis-Menten model of soluble enzyme kinetics was applied, and modifications to the model which attempt to account for diffusional effects were incorporated. The performance of the instrument in clinical analysis was evaluated. Excellent agreement with accepted methods was obtained in analysis of serum samples. Dissert. Abstr.

N79-21149 Wayne State Univ., Detroit, Mich.
FLUORESCENCE STUDY OF SOME MONO- AND DI-SUBSTITUTED BENZOIC ACIDS Ph.D. Thesis
Ibrahim Mahmoud Khasawneh 1978 130 p
Avail: Univ. Microfilms Order No. 7908932

A fluorescence study of benzoic acid and some of its mono- and di-substituted compounds is presented. An absorption study on these compounds in chloroform solvent is presented and the absorption wavelength maxima and the molar absorptivities are reported. The determination of each isomer in the presence of the other isomers is studied. It is found that some of these isomers can be determined easily in the presence of others, while some other isomers can not be determined and a separation prior to determination is needed. A fluorescence comparison study is presented to find out the effect of the nature of the substituents and their position on the fluorescence of the parent benzoic acid molecule. The fluorescence quantum efficiency of each isomer is determined using corrected spectrofluorometer and 9,10-diphenylanthracene in ethanol as a standard. Dissert. Abstr.

N79-21150 Iowa State Univ. of Science and Technology, Ames.
NEW TECHNIQUES FOR ANALYSIS OF ORGANIC POLLUTANTS IN DRINKING WATER Ph.D. Thesis
Larry Dean Kissinger 1978 157 p
Avail: Univ. Microfilms Order No. 7907258

A method was developed for determining haloforms in drinking water by sorption of the haloforms on columns packed with acetylated XAD-2. A pre-column of the abstractor packing was used to remove the pyridine solvent from the samples containing the haloforms concentrated from waters. Detection limits for the four chloro-, bromohaloforms in a 100 ml water sample using an electron capture detector were below 1 ppb (1 microgram/1). The production of haloforms in chlorinated waters was investigated. Addition of ascorbic acid to chlorinated waters was effective for stopping the production of haloforms. Small columns packed with Florisil were used to fractionate mixtures of organic compounds by gravity-flow liquid chromatography. Three fractions of organic compounds were collected from the Florisil columns. The recovery and elution behavior of many organic compounds was investigated. Organic compounds from fifteen waters were fractionated on Florisil. Dissert. Abstr.

N79-21151 Duke Univ., Durham, N. C.
SOME IMPORTANT FACTORS IN AQUEOUS-ORGANIC ANION EXCHANGE Ph.D. Thesis
John Williams Taylor 1978 132 p
Avail: Univ. Microfilms Order No. 7906994

Solvent uptake and concentration selectivity coefficient data were gathered for a few halide and halide-nitrate exchange systems in mixtures of water with methanol, 1-propanol and N, N-dimethyl-formamide. From resinate solvent uptake data, and the limited leterature data on anionic solvation, an attempt was made to predict at least qualitatively the dependence of selectivity on solvent composition. A limited model was developed for anion exchange which relates the number of moles of solvent transferred during a complete exchange to the magnitude of the solectivity coefficient. Qualitative agreement was found in methanol-water and dimethylformamide-water systems for the iodide-chloride exchange. No agreement was found in 1-propanol-water, probably due to the neglect of external solution activity coefficients in the simple model. Dissert. Abstr.

N79-21152 Wayne State Univ., Detroit, Mich.
DETERMINATION OF SIZE DISTRIBUTIONS IN HETERODISPERSE SYSTEMS OF HOMOGENEOUS, NON ABSORBING SPHERES FROM ANGULAR LIGHT SCATTERING EXTREMA Ph.D. Thesis
Werner Bergman 1978 347 p
Avail: Univ. Microfilms Order No. 7908894

The mathematical techniques and computer programs used to determine the angular light scattering extrema are discussed. Simpson's Rule is used in the light scattering code to perform numerical integration over the particle size distribution. The integration limits and integrand intervals are optimized based on

error analysis. A number of different numerical methods are investigated that determine the angular extrema including the Fibonacci search, interval halving, generalized interval reduction, parabola fitting and polynomial approximation methods. The number of computations required for each of these methods are then compared and show a large variation. The most efficient technique, the polynomial approximation method, requires one tenth the number of calculations of the least efficient technique, the interval halving method. Dissert. Abstr.

N79-21153 Iowa State Univ. of Science and Technology, Ames.
ANALYSIS OF MASS TRANSFER ACROSS MEMBRANES WITH CHEMICAL REACTION Ph.D. Thesis
Bert C. Wong 1978 109 p
Avail: Univ. Microfilms Order No. 7907291

A model for studying mass transfer between two cocurrent fluid streams separated by a membrane with and without chemical reaction in the membrane was developed. The model was applied to the study of estrogen transport in the placenta of the pregnant sheep. In general, it is found that the decrease in bulk concentration of the penetrant in the feed stream with dimensionless distance (or residence time) is more rapid when a chemical reaction is present. In this respect, the effect of a zeroth-order reaction is more marked than that of a first-order reaction. It is also found, using this model, that more of the product of a first-order reaction diffuses into the feed than into the extract, making the feed stream some 40 percent richer in the product than the extract at intermediate contact times, and about 1 percent at large contact times. Dissert. Abstr.

N79-21154 Pennsylvania Univ., Philadelphia.
MASS TRANSFER IN REACTIVE MEMBRANES: STUDIES ON THE FACILITATED TRANSPORT OF CO2 BY MONOETHANOLAMINE AND CO BY CUPROUS ION Ph.D. Thesis
Douglas Robert Smith 1978 217 p
Avail: Univ. Microfilms Order No. 7908796

The facilitated transport of carbon monoxide by cuprous ion and of carbon dioxide by monoethanolamine was investigated experimentally by use of radioactive tracers. The reaction kinetics of these two reversible reactions were explored by measuring the steady-state flux of the appropriate C-14 tracer through the membrane. The reactive solution, which was immobilized in a porous polyvinyl chloridemembrane, had been equilibrated with equal partial pressures of the untagged permeant. The net flux to the simple molecular diffusive flux through the membrane, was developed. Dissert. Abstr.

N79-21155 Notre Dame Univ., Ind.
SOME PROBLEMS CONCERNING TRANSPORT IN HETEROGENEOUS MEDIA AND CHEMICALLY REACTING SYSTEMS Ph.D. Thesis
Braulio Antonio Lacson DeVera, Jr. 1978 349 p
Avail: Univ. Microfilms Order No. 7908377

The effective thermal conductivity of a random heterogeneous media, primarily, a pore structured system was studied. The uniform and nonuniform size of random spheres showed identical results on the upper and lower bounds of the effective thermal conductivity and the limiting dilute case checks well with Maxwell reaction. The optimization of the yield of a host of chemical reaction networks for various isothermal reactor set-ups were discussed. Techniques were presented for analyzing uniqueness and multiplicity of steady states for: (1) substrate inhibited enzyme reaction in a tubular reactor with axial dispersion; (2) an isothermal bimolecular reversible reaction in a flat slab catalyst; and (3) exotermic consecutive reactions in an adiabatic CSTR. Elliptic integrals were used to determine the bulk composition for an isothermal second order catalytic reaction and the advantages and disadvantages of relating the axial dispersion with the generalized recycle models for the nonideal tubular reactor were discussed. Dissert. Abstr.

N79-21156 Columbia Univ., New York.
THE THERMAL CONDUCTIVITY OF MERCURY VAPOR TO 1000 DEGREES C Ph.D. Thesis
John Richard Siegel 1978 117 p
Avail: Univ. Microfilms Order No. 7908666

The method employing the frequency response of a thin hot wire was used to determine the thermal conductivity of mercury vapor in temperature range from 254 C to 992 C with an average superheat range up to 75 C. A thin tungsten wire was surrounded by mercury vapor in a cell and heated with an alternating current. The thermal conductivity of the mercury vapor was determined relative to that of argon by comparing the frequency response of the same wire to both mercury vapor and argon. The phenomenon of mercury dimerization is discussed. Several references on the diatomic nature of mercury vapor at various operating conditions were correlated and the effects of the disassociation of mercury vapor on its thermal conductivity estimated. An empirical correlation for percent dimer as a function on temperature and pressure is presented. Dissert. Abstr.

N79-21157 Idaho Univ., Moscow.
EXPERIMENTAL PRESSURE BROADENING IN METHYL ALCOHOL AT 337 MICROMETERS Ph.D. Thesis
Gary Lloyd Strine 1978 97 p
Avail: Univ. Microfilms Order No. 7908244

Experimentally determined values of M-dependent pressure broadening coefficients for transitions in the far infrared spectrum of methyl alcohol are reported. The measurement technique, Stark modulation spectroscopy, allows complete removal of the M-state degeneracy of those J-state transitions within the tuning range of the spectrometer. The pressure broadening coefficients determined by two limiting approximations differ by about 5 MHz/Torr, with the values corresponding to linear unfolding being smaller. Under the assumption of root mean square unfolding, averaged pressure broadening parameters for delta M = 1 transitions range from approximately 15 MHz/Torr for J = 6 transitions to nearly 25 MHz/Torr for J = 9 transitions. Corresponding values for delta M = 0 transitions average approximately 17 MHz/Torr for J values in the range of 6 to 8, inclusive. Dissert. Abstr.

N79-21158 Utah Univ., Salt Lake City.
ELECTROCHEMICAL OXIDATION OF CHALCOPYRITE Ph.D. Thesis
Garry Wilbur Warren 1978 170 p
Avail: Univ. Microfilms Order No. 7908346

The primary electrochemical techniques used in acid and ammoniacal solutions were potentiodynamic polarization, constant potential experiments, and capacitance measurements. In the acid system, the behavior of the mineral at low applied potential was different than that at more positive potentials. This difference is attributed to the initial formation of a defect intermediate surface layer deficient in iron, which is especially noticeable at lower potentials. In the ammonia system the experimental rest potentials were sensitive to solution concentration and obeyed the Nernst equation. FeOH(+) and S(-2)2 are metastable intermediates in the overall reaction consistent with mass balances and observed Tafel regions. Polarization curves revealed three distinct Tafel regions which were analyzed to yield an electrochemical model for the anodic dissolution of CuFeS2 in ammonia solutions involving a defect intermediate surface layer deficient in copper. Dissert. Abstr.

N79-21159 Ohio State Univ., Columbus.
LIME ENHANCED REDUCTION OF CHALCOCITE BY HYDROGEN Ph.D. Thesis
Kwame Sintim-Damoa 1978 149 p
Avail: Univ. Microfilms Order No. 7908218

The main objectives were to confirm the thermodynamic prediction that lime enhances the reduction of chalcocite, and to elucidate the reduction mechanisms through which the lime enhancement process is achieved. Reduction studies were conducted using both pure chalcocite and chalcocite/lime pressed samples. Synthetic chalcocite and reagent grade lime were used. Ultra pure hydrogen was used as a reductant. Reduction studies were conducted at a temperature of 650 - 900 C at flow rates of 1500 - 2500 cu cm min. CaO/Cu2S molar ratios used varied from 1 to 5. Cylindrical pellets of 12.7mm in diameter and thicknesses varying from 0.8mm to 10.6mm depending on the molar ratio were used. The thermogravimetric technique was used to measure the conversion of chalcocite by the method of weight loss. Dissert. Abstr.

N79-21160 Ohio State Univ., Columbus.
ELECTROCHEMICAL APPROACH TO THE CORROSION

PROBLEMS OF SEVERAL IRON-NICKEL-CHROMIUM ALLOYS IN HIGH TEMPERATURE HIGH PRESSURE WATER Ph.D. Thesis
June Bok Lee 1978 308 p
Avail: Univ. Microfilms Order No. 7908168

An electrochemical study for corrosion of Type 304 stainless steel, Inconel 600, Incoloy 800, Ni, Cr, and Pt in high temperature high pressure water was investigated. A silver-silver chloride electrode was the internal reference electrode. The study is two fold. The first is to determine the effects of dissolved oxygen, hydrazine, hydrogen peroxide, chromate, nitrate, temperature and alloy compositions on the corrosion potentials of Fe-Ni-Cr alloys. The second is the electrochemical study of corrosion kinetics with one of the Fe-Ni-Cr alloys, Type 304 stainless steel. The detailed electrochemical kinetics are the following: (1) potentiostatic anodic polarization studies with experimental variables of temperature, concentration of sulfate ion and scan rate; (2) potentiostatic cathodic polarization studies with experimental variables of temperature, scan rate, concentration of dissolved oxygen and concentration of Sulfate ion; (3) current decay experiments with experimental variables of time, applied potential, temperature and concentration of sulfate ion. Dissert. Abstr.

N79-21161*# Maryland Univ., College Park. Dept. of Chemistry.
A KINETICS INVESTIGATION OF SEVERAL REACTIONS INVOLVING CHLORINE CONTAINING COMPOUNDS Final Report, May 1974 - Aug. 1976
Douglas D. Davis Oct. 1978 122 p refs
(Grant NsG-1031)
(NASA-CR-3007) Avail: NTIS HC A06/MF A01 CSCL 07D

The technique of flash photolysis-resonance fluorescence was utilized to study nine reactions of stratospheric importance. The tropospheric degradation reactions of seven halogenated hydrocarbons were studied to assess their possible influx into the stratosphere. There are reactions of either Cl, OH, or O(3P) species with hydrogenated species, O3 or chlorinated compounds. Apart from the kinetic measurements, the quantum yield for the production of O(1D) from O3 in the crucial wavelength region of 293 to 316.5 nm was studied by utilizing a narrow wavelength laser as the photolysis source. The product formation was monitored by measuring the fluorescence of NO2 formed through O(1D) reaction with N2O followed by NO reaction with O3 to give NO2. Author

N79-21162# Indiana Univ., Bloomington. Dept. of Chemistry.
PROSPECTS FOR DINUCLEAR TRANSITION METAL CHEMISTRY ILLUSTRATED BY RECENT ADVANCES IN THE CHEMISTRY OF DIMOLYBDENUM AND DITUNGSTEN Final Report
Malcolm H. Chisholm 25 Oct. 1978 57 p refs
(Contract N00014-76-C-0826)
(AD-A062329; TR-78-14) Avail: NTIS HC A04/MF A01 CSCL 07/2

This manuscript represents both a final report and a technical report. (1) Publications, including those currently in press, acknowledging ONR support are listed. (2) Recent advances in the chemistry of Dimolybdenum and Ditungsten are reviewed. Special emphasis is placed upon the reactivity patterns of dinuclear compounds and the prospects for the future developments in this new area of transition metal chemistry. Author (GRA)

N79-21163# Wisconsin Univ. - Madison. Dept. of Chemistry.
A STUDY OF PHOTOPHYSICAL PROCESSES OF EXCITED STATES IN PHOTOCHEMISTRY Final Report, 1 Sep. 1975 - 31 Aug. 1978
Howard E. Zimmerman Nov. 1978 19 p refs
(Grant DAAG29-76-G-0014)
(AD-A062741; ARO-13132.5-C) Avail: NTIS HC A02/MF A01 CSCL 07/4

We have investigated a number of photochemical reactions and phenomena with an emphasis on the photophysical aspects. The research has focussed attention on a number of new photochemical reactions and systems. A number of generalizations have resulted from this research. Author (GRA)

N79-21164# Nevada Univ., Reno. School of Mines.
THE VAPOR PRESSURE OF HCl: WATER SOLUTIONS BELOW 0 C Interim Report, 1 May 1977 - 31 Aug. 1978
E. Miller Sep. 1978 7 p refs
(Grant AF-AFOSR-3333-77; AF Proj. 2308)
(AD-A062904; AFOSR-78-1525TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

An experimental study has been initiated to measure the equilibrium vapor pressure of solutions of hydrochloric acid at temperatures from 0 to -55C. Total vapor pressure data and calculated heat of vaporization values are reported for 19.9 wt pct and 36.0 wt pct solutions at temperatures of 0 to -40C. Measured vapor pressures at 0C agree with values reported by previous investigators. Total vapor pressures and partial pressures of 0 - 42 wt pct hydrochloric acid liquid and solid solutions from 0 to -55C are planned for the next contract period. Author (GRA)

N79-21165# California Univ., San Diego, La Jolla.
MEASUREMENTS OF GAS-PHASE REACTION RATES INVOLVING N2O AND CH2O Final Report
S. S. Penner 31 Dec. 1978 10 p refs
(Contract N00014-75-C-0261)
(AD-A063541) Avail: NTIS HC A02/MF A01 CSCL 07/2

Rate constants have been determined from shock-tube observations, in the interval 1685 less than or equal to T, K less than or equal to 2560, for the following elementary reaction steps: N2O + M to N2 + O + M, N2O + O to 2NO, and N2O + O to N2 + O2. Author (GRA)

N79-21166# National Bureau of Standards, Boulder, Colo. Thermophysical Properties Div.
DEVELOPMENT AND EVALUATION OF AN LNG SAMPLING MEASUREMENT SYSTEM
W. R. Parrish, J. M. Arvidson, and J. F. LaBrecque Jul. 1978 201 p refs
(PB-289938/3; NBSIR-78-887) Avail: NTIS HC A10/MF A01 CSCL 07D

The development and evaluation of procedures and components for sampling and analyzing LNG from flowing streams are described. Laboratory and field test results showed the total uncertainty in the computed heating value of samples taken with the recommended sampling system could be routinely within + or - 0.3 percent; this included the + or - 0.1 percent uncertainty in analysis by gas chromatography. Three sample probes and two vaporizer designs were considered. Of the ten operating variables considered, six were found to be important in sampling. Test results were used to establish recommended design and operating criteria. GRA

N79-21167# National Bureau of Standards, Washington, D. C.
TEST PROCEDURES FOR THE DETERMINATION OF THE GROSS CALORIC VALUE OF REFUSE AND REFUSE-DERIVED-FUELS BY OXYGEN BOMB CALORIMETRY: SUMMARY OF THE 1977 FISCAL YEAR RESULTS Interim Report, 1 Apr. - 30 Sep. 1977
D. R. Kirklin, D. J. Mitchell, J. Cohen, E. S. Domalski, and S. Abramowitz Dec. 1978 36 p refs Sponsored in part by DOE and EPA
(PB-290160/1; NBSIR-78-1494) Avail: NTIS HC A03/MF A01 CSCL 07D

Procedures used for coke and coal were modified to determine the gross caloric values (moisture and ash-free basis) for refuse derived from fuels provided by two manufacturers. The values obtained for one fuel ranged from 24.51 to 25.20 MJ kg (10539 to 10835 Btu lb) with a standard deviation of 0.8%. Values of the other product ranged from 21.93 to 22.16 MJ kg (9427 to 9528 Btu lb) with a standard deviation of 0.4%. Results of 23 laboratory samples are presented at various stages of sample preparation which were derived from single field samples from each of the two sources. Calorimetric results based on an equilibrated laboratory sample are presented along with some semi-quantitative spectrochemical results. The results indicate that the techniques of oxygen bomb calorimetry can be successfully applied to a non-homogeneous refuse stream after considerable processing to prepare a homogeneous refuse-derived fuel. GRA

N79-21168# Rhode Island Univ., Kingston. Coll. of Pharmacy.
INTERACTION OF CHLORINE AND ORGANIC MOLE-

CULES - EFFECTS OF INORGANICS Final Report, 1 Oct. 1976 - 30 Jun. 1978
Yuzuru Shimizu 1978 21 p
(Contract DI-14-34-0001-7184)
(PB-289391/5; W79-01903; OWRT-B-076-RI(1)) Avail: NTIS HC A02/MF A01 CSCL 07D

The effect of heavy metal ions, particularly ferric and manganese ions, on reactions of organic molecules and chlorine in aqueous media, were studied. The conversion of amino acids (phenylalanine) to the corresponding aldehydes and nitriles by chlorine treatment was remarkably enhanced in the presence of ferric ion. The result implies that both the rates and courses of reactions between organics and chlorine (hypochlorite) can be altered greatly in the water containing a high concentration of ferric ion. Also, it implies a rapid depreciation of active chlorine in such water. No catalyzing effect was observed with manganese ion. GRA

N79-21169# Montana State Univ., Bozeman. Water Resources Research Center.
PREDICTING THE ANAEROBIC DEGRADATION OF ORGANIC CHEMICAL POLLUTANTS IN WASTE WATER TREATMENT PLANTS FROM THEIR ELECTROCHEMICAL REDUCTION BEHAVIOR
R. D. Geer Jul. 1978 63 p refs
(Contract DI-14-34-0001-7055)
(PB-289224/8; MUJWRRC-95; W79-01539; OWRT-A-097-MONT(1)) Avail: NTIS HC A04/MF A01 CSCL 07D

The results of this study show the rather general and simple hypothesis, that the redox potential of an organic pollutant alone controls its ability to degrade anaerobically, to be incorrect. The results support the concept that reduced iron porphyrins present in anaerobic systems mediate the degradation of some specific types, of organic compounds. Good data on the rate of degradation of four compounds in sewage sludge were obtained. GRA

N79-21170# National Bureau of Standards, Washington, D. C. National Measurement Lab.
PROCEEDINGS OF WORKSHOP ON ASBESTOS: DEFINITIONS AND MEASUREMENT METHODS
C. C. Gravatt, Philip D. LaFleur, and Kurt F. Heinrich Nov. 1978 494 p refs Workshop held at Gaithersburg, Md., 18-20 Jun. 1977 Sponsored in part by Occupational Safety and Health Administration
(PB-289730/4; NBS-SP-506; LC-78-600109) Avail: NTIS HC A21/MF A01 CSCL 08G

Proceedings of a conference on Asbestos: Definitions and Measurement Methods' which was jointly sponsored by the National Bureau of Standards of the U.S. Department of Commerce and the Occupational Safety and Health Administration of the U.S. Department of Labor is described. The discussion portions of the Workshop also have been included as has written material appropriate to the topics under consideration which was submitted to the editors at a later date. The Workshop covered four major topics: Mineralogical Aspects, the Relationship Between Chemical and Physical Properties and Health Effects, Analytical Methods, and Regulatory Positions and Criteria. Also included in these proceedings is a summary of these topics. GRA

N79-21171# National Bureau of Standards, Washington, D. C. National Measurement Lab.
WORKSHOP ON HIGH TEMPERATURE CHEMICAL KINETICS: APPLICATIONS TO COMBUSTION RESEARCH
D. Garvin, R. L. Brown, and R. F. Hampson Dec. 1978 93 p refs Workshop held at Gaithersburg, Md., 12-13 Dec. 1977; sponsored by DOE
(PB-289918/5; NBS-SP-531; LC-78-600125) Avail: NTIS HC A05/MF A01 CSCL 07D

The proceedings at a workshop on the applications of high temperature chemical kinetics to combustion research are summarized. Experimental techniques, measurements, theoretical developments, and data evaluation were reviewed. The program of the meeting abstracts of the review papers, a commentary by the organizers of the meeting, summaries of the discussions, formal comments submitted by the participants, and an attendance list are presented. GRA

N79-21172# Montana State Univ., Bozeman. Dept. of Chemical Engineering.
REDUCTION OF NITRIC OXIDE WITH METAL SULFIDES Final Report, Jun. 1972 - May 1978
F. P. McCandless and Kent Hodgson Nov. 1978 97 p refs
(Grant EPA-R-800682)
(PB-289450/9; EPA-600/7-78-213) Avail: NTIS HC A05/MF A01 CSCL 07D

Nineteen different metal sulfides were investigated, using a test gas of pure NO. Although most sulfides resulted in some NO reduction, BaS, CaS, SrS, and FeS were the most promising. Several catalysts reduced the temperature at which the reduction process proceeds by as much as 200 C. A further temperature reduction was obtained by impregnating the sulfide and catalyst on high surface area supports of activated alumina or molecular sieves. The most promising catalysts were NaF, NiC 12, and FeC 12. All combinations of the most promising sulfide and catalysts were tested for NO reduction, using a synthetic fuel gas containing 1000 ppm NO and 1% O2. It was concluded that these sulfides can reduce NO in the presence of O2, but more research is required to establish the economic feasibility. GRA

N79-21173# National Bureau of Standards, Washington, D. C.
INTERAGENCY COMPARISON OF ULTRAVIOLET PHOTOMETRIC STANDARDS FOR MEASURING OZONE CONCENTRATIONS
J. Wendt (Calif. Air Resources Board, El Monte), J. Kowalski (Calif. Air Resources Board, El Monte), A. M. Bass, C. Ellis (EPA, Durham, N. C.), and M. Patapoff (JPL) Dec. 1978 30 p refs
(PB-289966/4; NBS-SP-529; LC-78-600126) Avail: NTIS HC A03/MF A01 CSCL 14B

In August 1977, an interlaboratory comparison study was initiated after the California Air Resources Board and the Environmental Protection Agency, Research Triangle Park independently designed and constructed ozone absolute ultraviolet photometers. A multipoint comparison using the NBS photometer as the standards was studied. The results of the data analysis indicate excellent agreement with a total variation of 2.8%. Compared to the NBS photometer the EPA-RTP photometer read 1.3% low, the JPL photometer read 1.5% high, and the ARB photometer read 0.4% low. The correlation coefficients of the same data sets were 1.0000, and 0.9999 respectively. GRA

N79-21174# National Technical Information Service, Springfield, Va.
LASER RAMAN SPECTROSCOPY. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1970 - Feb. 1979
Diane M. Cavagnaro Mar. 1979 178 p Supersedes NTIS/PS-77/0119; NTIS/PS-76/0099; NTIS/PS-75/160 (NTIS/PS-79/0056/6; NTIS/PS-78/0108; NTIS/PS-77/0119; NTIS/PS-76/0099; NTIS/PS-75/160) Avail: NTIS HC $28.00/MF $28.00 CSCL 07D

The theory and applications of laser Raman spectroscopy are cited, including studies on crystal structure, laser excitations of the molecule into the different energy levels, gas analysis, and theoretical interpretation of spectra. GRA

N79-21175# Dow Chemical Co., Walnut Creek, Calif. Western Div. Research Labs.
DEVELOPMENT OF A 50,000 GPD SEAWATER REVERSE OSMOSIS PILOT PLANT BASED ON CELLULOSE TRIACETATE HOLLOW FINE FIBERS Final Report
Sep. 1978 284 p refs
(Contract DI-14-30-3188)
(PB-291158/4; W79-02676; OWRT/S-78/9(3188)(1)) Avail: NTIS HC A13/MF A01 CSCL 07D

A commercially attractive seawater desalting module based on cellulose triacetate hollow fine fibers was developed. It was designed to determine the level of pretreatment necessary to maintain good module performance, and demonstrate the economics and feasibility of reverse osmosis for seawater desalination by constructing and operating a 50,000 GPD pilot plant at the Wrightsville Beach Test Facility. Development and testing of eight-inch (2500 GPD) modules was highly successful and the product water cost was low enough to assure that reverse osmosis gain acceptance in seawater desalting. An

expanded pretreatment study was necessary and resulted in development of diatomaceous earth filtration as an economically competitive and technically superior alternative to sand filtration for pretreating feedwater. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N79-21176 Florida Univ., Gainesville.
SPECTRO-ELECTROCHEMICAL STUDIES OF THE INHIBITION EFFECT OF 4,7-DIPHENYL-1,10-PHENANTHROLINE ON THE CORROSION OF 304 STAINLESS STEEL Ph.D. Thesis
Hsuan-Jung Huang 1978 129 p
Avail: Univ. Microfilms Order No. 7907752

The compound 4,7-diphenyl-1,10-phenanthroline, which has a strong absorption band in the UV absorption region, is slightly soluble in acidic aqueous solution (to about .0001 M) and is potentially a good inhibitor, was selected to study the relationship between adsorption and inhibition on the corrosion of 304 stainless steel in 0.1 M HC1 solution. A 304 stainless steel cylinder with an approximate surface area of 5 sq cm was used as the test electrode and solid adsorbent. The current vs. potential behavior of the system was determined potentiostatically and the amount of the inhibitor adsorbed on the electrode surface was measured by the concentration depletion method using the modified dual-wave-length spectrophotometric method. Dissert. Abstr.

N79-21177 Pennsylvania State Univ., University Park.
AN ANALYTICAL PSEUDOPOTENTIAL TREATMENT OF COHESION IN METALS Ph.D. Thesis
Harry Robert Scholz 1978 74 p
Avail: Univ. Microfilms Order No. 7909127

A relatively simple expression describing the energy of a crystal was developed for analyzing the atomic properties of small core metals. The band-structure contribution to the crystal energy was evaluated in direct space using a local bare ion potential and the large q behavior of Hartree's dielectric screening function. There were two adjustable parameters in the bare ion potential. One was the effective core radius rc and the other was a repulsive strength term M. The normalized energy-wavenumber characteristics G(q) was obtained using both the Hartree dielectric function and the large q behavior of Hartree's dielectric function. Better agreement was obtained when G(q) was evaluated using the large q behavior of Hartree's dielectric function than when using Hartree's dielectric function. Dissert. Abstr.

N79-21178 Ohio State Univ., Columbus.
MULTIPHASE BINARY DIFFUSION IN THE SILVER-ZINC SYSTEM Ph.D. Thesis
David Slate Williams 1978 180 p
Avail: Univ. Microfilms Order No. 7908236

Three theoretical treatments of the kinetics multiphase binary diffusion were critically analyzed and compared with experiments performed on silver-zinc alloys. The analyses by Wagner and Shatynski, Hirth and Rapp were algebraically demonstrated to be equivalent. The two forms involved different experimental parameters and can, therefore, be implemented in a complementary manner. The analysis by Kidson was a valid treatment of the kinetics of multilayer growth but of little practical use because of the prohibitive amount of experimental data required for implementation. The equations which describe multilayer growth in bulk diffusion couples were applied to the problem of the failure of the equilibrium phase configuration to appear in thin film couples. The relative thickness required by the relations of quasi-steady-state growth impose a nucleation constraint upon the growth of thin films. Dissert. Abstr.

N79-21179 Columbia Univ., New York.
A CORRELATION OF THE THERMODYNAMIC PROPERTIES OF THE QUATERNARY SLAG SYSTEM Fe-O-SiO2-CaO Ph.D. Thesis
Rajendra Prakash Goel 1978 159 p
Avail: Univ. Microfilms Order No. 7908601

The basic features of the model are: the assumption of hypothetical equilibrium species described, are FeO1,5, FeO, Fe, SiO2, CaO and 2CaO.SiO2, describing the slag composition, and the non-ideal behavior of these species described by Margules equations, with zero ternary interactions. Chemical equilibria between the species govern the relative proportion of each species in the slag through the thermodynamic equilibrium constant whose form requires rapid changes in the mole fractions of the species in certain regions of composition. The Margules equations for the activity coefficients of the chemical species are consistent with the Gibbs-Duhem relation. The parameters of the Margules equations are assigned a temperature dependence consistent with that of regular solutions. The phase diagrams, synthesized from the model predictions, provide an effective means for checking the consistency of the free energy data with the phase boundary data. Dissert. Abstr.

N79-21180 Columbia Univ., New York.
MICROSTRUCTURAL AND MACROSTRUCTURAL EFFECTS ON SUPERALLOY CREEP IN AIR AND VACUUM Ph.D. Thesis
Jeffrey Max Davidson 1978 102 p
Avail: Univ. Microfilms Order No. 7908588

The roles of grain boundaries and external surfaces on creep behavior of a single nickel-base superalloy were studied in two environments, air and vacuum. For nearly all of the grain size, environment combinations, thick specimens were more creep resistant than thin specimens. For creep in vacuum, this data is consistent with the existence of an intrinsically weak surface layer, which may also be grain size dependent. For creep in air, that thick specimens are more creep resistant than thin specimens can be attributed to the greater proportion of specimen grains, and hence grain boundary channels for air penetration, at the surface for thin specimens. This effect is in direct competition with surface oxide scale strengthening in air, which leads to greater creep resistance for thin specimens. The results are also discussed with respect to the apparent stress dependency exponents and the back stress concept. Dissert. Abstr.

N79-21181 Rensselaer Polytechnic Inst., Troy, N. Y.
A STUDY OF STRESS-CORROSION CRACKING IN STAINLESS STEEL WELDMENTS CONTAINING FERRITE Ph.D. Thesis
William Andrew Baeslack, III 1978 234 p
Avail: Univ. Microfilms Order No. 7903208

The influence of ferrite present in both the weldment fusion zone and in regions which bound the fusion zone on stress corrosion cracking behavior was investigated using constant extension rate tensile testing techniques. Type 304 base metal and stainless steel weldments of various ferrite contents were tested both in room and in elevated temperature chloride containing solutions over a range of extension rates. In addition, the feasibility of using precracked specimens and linear elastic fracture mechanics analysis to determine room temperatures stress corrosion crack propagation rates in Type 304 stainless steel was studied. Tensile tests conducted on both Type 304 base metal and on all weld metal specimens in room temperature, 1N HC1 found the duplex weld metal to be more susceptible to environmentally induced cracking than the base metal, particularly at low extension rates. Dissert. Abstr.

N79-21182 Syracuse Univ., N. Y.
KINETIC AND MECHANISTIC ASPECTS OF GASEOUS HYDROGEN EMBRITTLEMENT Ph.D. Thesis
Karl Sieradzki 1978 126 p
Avail: Univ. Microfilms Order No. 7908564

A model explaining subcritical crack growth in a gaseous hydrogen environment was developed on the basis of adsorption. The model predicts a low temperature dependence, and a room temperature dependence. Subcritical crack growth in a quenched and tempered 4340 steel was studied as a function of hydrogen pressure at 298 K. Crack growth rates as a function of stress intensity, K, exhibited a K dependent region (stage 1) and a K independent region (stage 2). In stage 1 the crack growth rate is proportional to P sub H2 to the nth power where n is greater than 1 and in stage 2 the crack growth rate is proportional to

P sub H2. Crack growth behavior was also investigated in H2S, HBr, HI, Cl2, and partially dissociated N2 environments. The relative propensity which these gases display with respect to inducing embrittlement in the 4340 steel tested is rated as H2S is greater than H2 is greater than HI, HBr is greater than Cl2, diss N2. Dissert. Abstr.

N79-21183*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SURFACE FINISHING Patent Application
Jack A. Kinzler, James T. Heffernan, Leroy G. Fehrenkamp, and William S. Lee, inventors (to NASA) Filed 25 Jan. 1979 26 p
(NASA-Case-MSC-12631-3; US-Patent-Appl-SN-006952) Avail: NTIS HC A03/MF A01 CSCL 11F

A manufacturing process is described which reduces or eliminates air turbulence created by surface irregularities in metal airfoils due to rivets, wrinkles, or butt-joints. The metal surface of the airfoil is cleaned, then coated with a thin layer of a fluid adhesive over which a sheet of thin plastic film is stretched. Tension is applied to the film and the resultant surface is then squeezed to cause the adhesive to conform to the irregularities, remove any bubbles, and smooth out any wrinkles in the film. The adhesive is then allowed to set. The resulting surface is smooth and relatively free of the normal irregularities present in the standard metal airfoil, particularly for low speed aircraft. NASA

N79-21184*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WEAR OF ALUMINUM AND HYPOEUTECTIC ALUMINUM-SILICON ALLOYS IN BOUNDARY-LUBRICATED PIN-ON DISK SLIDING
John Ferrante and William A. Brainard Apr. 1979 27 p refs
(NASA-TP-1442; E-9809) Avail: NTIS HC A03/MF A01 CSCL 11F

The friction and wear of pure aluminum and a number of hypoeutectic aluminum-silicon alloys (with 3 to 12 wt %Si) were studied with a pin-on-disk apparatus. The contacts were lubricated with mineral oil and sliding was in the boundary-lubrication regime at 2.6 cm/sec. Surfaces were analyzed with photomicrographs, scanning electron microscopy, X-ray dispersive analysis, and diamond pyramid hardness measurements. There were two wear regimes for the alloys - high and low - whereas pure aluminum exhibited a high wear rate throughout the test period. Wear rate decreased and the transition stress from high to low wear increased with increasing hardness. There was no correlation between friction coefficient and hardness. A least squares curve fit indicated a wear-rate dependence greater than the inverse first power of hardness. The lower wear rates of the alloys may be due to the composites of silicon platelets in aluminum resulting in increased hardness and thus impairing the shear of the aluminum. Author

N79-21185# Defence Research Information Centre, Orpington (England).
MARINE CORROSION TESTING ON COLD WORKING COPPER-ALUMINUM ALLOYS: DIFFICULTIES IN SIMULATING CONDITIONS OF USE
J. Barbery, C. Pepin-Donat, C. Drapier, D. Whitwham, and O. Diner Nov. 1978 35 p refs Transl. into ENGLISH from Materiaux et Tech. (France), V. 78, 1977 p 435-448
(DRIC-T-5461; BR67220) Avail: NTIS HC A03/MF A01

Corrosion testing in synthetic sea water by repeated dipping, with and without a sustained external stress and immersion in a continuous flow of 1m/s of sea water was carried out for 6 to 18 months on test places in the form of rods (3.2mm diameter and 500mm long) from 12 alloys in both cold-worked and annealed states. Four criteria of merit were used: appearance; micrographic examination; loss of weight; loss of relative tensile strength. The overall assessment was carried out by comparing the results obtained with the different alloys using Spearman's rank correlation test. Some systematic effects were established, but in general each alloy exhibited an individual response to corrosion. J.M.S.

N79-21186# United Technologies Research Center, East Hartford, Conn.
COATINGS FOR DIRECTIONALLY SOLIDIFIED GAMMA PRIME-GAMMA PLUS ALPHA EUTECTICS Final Report, 1 Aug. 1977 - 31 Jul. 1978
John G. Smeggil 22 Oct. 1978 50 p refs
(Contract N00019-77-C-0424)
(AD-A063570; UTRC/R78-912959) Avail: NTIS HC A03/MF A01 CSCL 11/6

The oxidation/corrosion characteristics of directionally solidified eutectics including gamma prime-gamma plus alpha alloys are sufficiently well documented to state that oxidation and hot corrosion resistant coatings will be required over a wide range of temperatures. The specific problem with respect to coating the gamma/gamma-alpha family of alloys is not simply coating chemistry. Rather the major obstacle here involves mating the anisotropic thermal expansion behavior of the substrate with that of the coating so that the latter will not crack under thermal cycling. The approach taken in this study includes minimizing the differences in thermal expansion between the protective coating and the eutectic substrate by selective alloying of the coating and increasing the strain capacity of the coating. GRA

N79-21187# Martin Marietta Labs., Baltimore, Md.
THE DELAYED FRACTURE OF ALUMINUM ALLOYS Annual Progress Report
R. K. Viswanadham, T. S. Sun, and J. A. S. Green Dec. 1978 19 p refs
(Contract N00014-74-C-0277)
(AD-A063584; MML-TR-78-55) Avail: NTIS HC A02/MF A01 CSCL 11/6

Prior studies on the grain boundary segregation of Al-Zn-Mg alloys have shown that Mg and Zn are heavily segregated to the grain boundaries. AES studies coupled with plasmon-loss measurements have enabled identification of the chemical state of the segregants present on the grain boundary. These studies show that in the as-quenched condition, the Mg and Zn segregated along the grain boundaries are present in solid solution. In the peak-and over-aged conditions, all the Zn is incorporated into the MgZn2 particles while a major fraction of Mg is present as free Mg. In the as-quenched condition, the segregants are confined to about 50 to 100 angstrom from the grain boundary. Utilizing the vacancy solute drag model, it is possible to qualitatively account for the observed extent of solute segregation. The implications to stress corrosion cracking (SCC) of the free Mg observed on the grain boundaries under all heat treatment conditions can be analyzed by proposing Mg-H complex formation. Consequently this year's efforts were focused on studying the effect of the Mg/Zn ratio on the SCC susceptibility of Al-Zn-Mg alloys. GRA

N79-21188# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
INFLUENCE OF METALLURGICAL FACTORS ON THE FATIGUE CRACK GROWTH RATE IN ALPHA-BETA TITANIUM ALLOYS Final Report, 1 Apr. 1974 - 21 Nov. 1977
J. C. Chesnutt, A. W. Thompson, and J. C. Williams May 1978 423 p refs
(Contract F33615-74-C-5067)
(AD-A063404; SC584.42TR; AFML-TR-78-68) Avail: NTIS HC A18/MF A01 CSCL 11/6

Research was conducted on two alpha-beta titanium alloys, Ti-6Al-4V and Ti-6Al-2Sn 4Zr-6Mo, as a function of alloy composition microstructure and strength level, environment, and fatigue loading conditions. A wide range of microstructural conditions, seven for Ti-6Al-4V and three for Ti-6Al-2Sn-4Zr-6Mo, was chosen to provide a full range of constituent types and morphologies and a range of mechanical properties. All the material for the program was obtained in the form of pancake forgings which were uniformly and weakly textured. The initial portion of the program consisted of material characterization and base line fatigue crack propagation (FCP) testing. Characterization included a full description of microstructures, as well as mechanical property testing, fracture toughness tests, S-N curve determination and measurement of other properties such as modulus and texture. Base line FCP testing in dry air at two stress ratios (R) of 0.1 and 0.3; and in a 3.5% NaCl solution at 1 and 20 Hz was conducted in this portion of the program. Results of this study included the determination that transform-

ed beta microstructures generally exhibit the greatest fatigue crack propagation resistance and that increasing the load ration, R, can lead to significant increases in crack growth rate; the behavior in both cases was rationalized in terms of crack tip interaction with microstructural constituents. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N79-21189 Texas Univ. at Austin.
THERMODYNAMIC BEHAVIOR OF POLYSTYRENE SOLUTIONS STUDIES BY SEDIMENTATION EQUILIBRIUM Ph.D. Thesis
Sung Gun Chu 1978 212 p
Avail: Univ. Microfilms Order No. 7817624

The thermodynanic behavior of polystyrene solutions was studied experimentally and theoretically to achieve a quantitative understanding of polymer solutions. The experimental techniques included sedimentation analysis, viscometry, precision refractometry and densitometry. The computer was used extensively to analyze the experimental data. The thermodynamic behavior of polystyrene in single solvent systems (benzene and bromobenzene) was investigated by means of experiments of sedimentation equilibrium. A method of analysis was designed to yield the interaction factors wave length and F as a function of concentration. The thermodynamic behavior of polystyrene mixed solvent systems was also studied. The preferential adsorption coefficient wave length and second virial coefficient A for three polystyrene samples in two solved mixtures were measured by sedimentation equilibrium techniques. Dissert. Abstr.

N79-21190* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INFUSIBLE SILAZANE POLYMER AND PROCESS FOR PRODUCING SAME Patent
Robert E. Burks, Jr. (Southern Res. Inst., Birmingham, Ala.), Robert E. Lacey (Southern Res. Inst., Birmingham, Ala.), and Charles L. Christy, Jr., inventors (to NASA) (Southern Res. Inst., Birmingham, Ala.) Issued 28 Mar. 1967 2 p Filed 30 Aug. 1965 Sponsored by NASA
(NASA-Case-XMF-02526-1; NASA-Case-XMF-02527-1; NASA-Case-XMF-02783-1; US-Patent-3,311,571; US-Patent-Appl-SN-483817; US-Patent-Class-260-2) Avail: US Patent and Trademark Office CSCL 07D

Coatings of high thermal and chemical stability for application to metal, glass, ceramics, and other surfaces are formed by reacting diphenyldichlorosilane in the presence of triethylamine with a nitrogen base selected from the group consisting of ammonia and methylamine. The pl polymeric, noncrystalline reaction product is heated in a reaction zone open to the atmosphere at a temperature ranging from approximately 250 C to 450 C until the infusible polymer is formed. A.R.H.

N79-21191* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLUORINE-CONTAINING POLYFORMALS Patent
Floyd D. Trischler, inventor (to NASA) (Whittaker Corp., Los Angeles) Issued 31 Dec. 1968 2 p Filed 3 Jun. 1966 Sponsored by NASA
(NASA-Case-XMF-06900-1; US-Patent-3,419,531; US-Patent-Appl-SN-554959; US-Patent-Class-260-67) Avail: US Patent and Trademark Office CSCL 07C

A fluorine-containing polymeric polyformals is described which has the repeating unit O CH2 O CH2 (CF2) sub n CH2 wherein n is an integer of from about 3 to about 6 prepared by reacting trioxane with a diol having the formula HO CH2 (CF2) sub n CH2 OH. These polymeric polyformals are useful directly for impervious coatings on metals and the like.
Official Gazette of the U.S. Patent and Trademark Office

N79-21192 Lehigh Univ., Bethlehem, Pa.
COLORANT FORMULATION OF METALLIC PAINTS Ph.D. Thesis
Kwok Ching Lau 1979 106 p
Avail: Univ. Microfilms Order No. 7908513

The colorant formulation of metallic paints is complicated by the change of color with viewing angle. However, by using the multichannel version of the radiative transfer theory, it is possible to calculate the intensities, hence the color at various angles. Procedures were established to characterize aluminum flakes and pigments in terms of the radiative transfer parameters, based on conventional reflectance and transmittance measurements. Good agreement between the measured and the predicted reflectances were obtained for the mixtures. Angular intensity distributions explaining the darkening effect are obtained from the Kubelka-Munk theory. The effects of the aluminum flake size on the color of the paint films were studied. Normally, film of large flake size is lighter than that of small flake size. However, the reverse is true if the viewing angle exceeds a certain value. This inversion in intensity is predicted by the theory.
Dissert. Abstr.

N79-21193 Institute of Paper Chemistry, Appleton, Wis.
RETENTION DYNAMICS FOR SMALL PARTICLES ON CYLINDRICAL FIBERS Ph.D. Thesis
David Albert Dyer 1977 215 p
Avail: Univ. Microfilms Order No. 7907012

The relative importance of hydrodynamic and colloidal forces thought to exist within a retention system are investigated. Such forces were assumed to affect the transport mechanisms of intertial impaction, flow-line interception, and diffusion. In addition, the effects of molecular attractive forces and double-layer interaction were studied. Each was evaluated by investigating which type of interaction produced the greatest change in retention. In this way relevant data was obtained concerning particulate matter removal from a flow stream by a fiber assemblage. The objective was accomplished through the construction of a mathematical model, developed to predict retention occurring in a simplified flow system. The model is based on the equivalent unit cell approach and a set of particle motion equations, which describe a particle's trajectory through this cell. An experimental program was performed to provide data for a comparison with model predictions. Dissert. Abstr.

N79-21194 Columbia Univ., New York.
AUTOXIDATION OF KETENES AND ALPHA-PEROXYLACTONE CHEMISTRY, PART 1. ENERGY TRANSFER AND SINGLET OXYGEN DIFFUSIVITY IN POLYMER MATRICES Ph.D. Thesis
Ming-Fea Chow 1978 136 p
Avail: Univ. Microfilms Order No. 7908587

A study of the chemiluminescent decomposition of three alpha-peroxylactones was undertaken. Each compound decomposes to yield CO2 and the corresponding keytone in high yield. The chemiluminescent species produced in these reactions were characterized by a number of different measurements including spectral distribution by direct chemiluminescne, lifetimes, energy transfer, activation parameters and photochemical reactions. A chemiluminescence procedure for generating and detecting singlet oxygen in polymer films was developed. The method involves the production of singlet oxygen from naphthalene endoperoxides, followed by diffusion of singlet oxygen to an acceptor which reacts with singlet oxygen to form a chemiluminescent product. Measurement of the resulting chemiluminescence as a function of acceptor concentration provides information on the diffusivity and reactivity of singlet oxygen in polymers films. Dissert. Abstr.

N79-21195 City Univ. of New York.
PHOTODEGRADATION OF POLYVINYLCHLORIDE Ph.D. Thesis
John Joseph Liutkus 1979 116 p
Avail: Univ. Microfilms Order No. 7908461

The behavior of polyvinylchloride (PVC) under ultraviolet irradiation was investigated by electron spin resonance spectroscopy (ESR). Various polymers of vinyl chloride were prepared to observe the effect of physiochemical properties on photodegradation, and to eliminate impurity effects often found on use of commercial samples. Polyvinylbromide and copolymers of vinyl chloride/vinyl bromide were also prepared as polymer analogs for PVC. In addition, low molecular weight halocarbons, and specifically deuterated samples were synthesized to aid in the

analysis of ESR spectra. The poorly resolved ESR spectra obtained from irradiated polymer films and powders was improved with the use of a polymer glass system. Dissert. Abstr.

N79-21196 Pennsylvania State Univ., University Park.
ESTER OXIDATION UNDER SIMULATED BOUNDARY LUBRICATION CONDITIONS Ph.D. Thesis
Frances Ellen Lockwood 1978 177 p
Avail: Univ. Microfilms Order No. 7909097

Oxidation by the thin-film microtest method was investigated as a means of evaluating and comparing the chemical properties of ester lubricants. The oxidation products were compared using gel permeation chromatography and atomic absorption spectroscopy. The inhibited stable life, during which little fluid oxidation occurs, was determined for lubricant formulations containing organic ester basestocks and various combinations of phenothiazine and phenyl alpha-anapthylamine lubricators, and tricresyl phosphate. A model was developed which predicted lubricator oxidation rates, evaporation rates, and length of lubricant stable life, at temperatures from 44 to 520 K. Dissert. Abstr.

N79-21197 Pennsylvania State Univ., University Park.
INFLUENCES OF POLYMER SOLUTION PROPERTIES ON FLOW IN POROUS MEDIA Ph.D. Thesis
Fred Horng-Lieh Wang 1978 168 p
Avail: Univ. Microfilms Order No. 7909146

Effects of shear rate dependence, viscoelasticity, and molecule-wall interactions on the flow in porous media are studied. The effects of each mechanism are demonstrated by correlations of the dimensionless parameters. Packed beds of 325-400 mesh beads demonstrate the effects of xanthan gum adsorption on the fluid mechanics in porous media. Permeability reduction corresponding to monolayer adsorption is observed when the packed bed is flooded with polymer solution. The permanently adsorbed monolayer is deformable under the shear fields. An increase of shear rate decreases the effective adsorption thickness and hence the percentage reduction of permeability. Adsorption thickness is recoverable when the shear fields are removed. Mechanical entrapment of polymer molecules is small and causes no detectable effect on the permeability reduction.Dissert. Abstr.

N79-21198 Northwestern Univ., Evanston, Ill.
ELASTIC PROPERTIES OF WELL-CHARACTERIZED RUBBER NETWORKS Ph.D. Thesis
Dale Sheldon Pearson 1978 207 p
Avail: Univ. Microfilms Order No. 7907924

A series of rubber networks were prepared by crosslinking ethylenepropylene copolymers of different molecular weight with high energy electron radiation. The rate of increase in gel content with radiation exposure was used to determine the crosslink density and other structural features of the networks. Stress-strain measurements in tension on the same samples revealed that the elastic modulus was considerably greater than that predicted by the classical theories of rubber elasticity. The modulus, however, could be accurately calculated by assuming it to be the sum of two parts, the first proportional to the number of strands in the network and the second proportional to the fraction of molecular entanglements which are trapped by the crosslinking process. The equilibrium solvent swelling ratio of each network was measured and found to correlate well with the calculated initial modulus provided that the entanglement part was included.
Dissert. Abstr.

N79-21199 Pennsylvania State Univ., University Park.
ELEVATED-TEMPERATURE SLOW CRACK GROWTH IN HOT-PRESSED AND SINTERED SILICON CARBIDE CERAMICS Ph.D. Thesis
Kelly David McHenry 1978 146 p
Avail: Univ. Microfilms Order No. 7909101

The macrocrack behavior from double torsion measurements of hot pressed silicon carbide and a sintered silicon carbide was compared to microflaw behavior obtained from stress-stress rate tests. The impurities in the two materials were identified using emission spectroscopy and neutron activation analysis. The microstructures were characterized using SEM and TEM analyses. The hot-pressed material exhibited slow crack growth behavior that was insensitive to testing temperature and environment. Scanning electron micrographs illustrate the viscous separation of the grain boundary phase in this material when fractured at elevated temperatures. Viscous flow is also suggested by the load-deflection curves of bend specimens broken at a low stress rate at elevated temperatures. Slow crack growth could not be observed in the sintered silicon carbide from double torsion measurements. Dissert. Abstr.

N79-21200# Royal Aircraft Establishment, Farnborough (England).
A COMPARATIVE INVESTIGATION OF FLAME RETARDANTS
A. Hopp, H.-P. Skilandat, Barbara Taubert, and I. Klotzscher Jul. 1978 27 p refs Transl. into ENGLISH from Plaste Kaut. (East Ger.), v. 23, no. 3, 1976 p 192-197
(RAE-Lib-Trans-1974; BR67253) Avail: NTIS HC A03/MF A01

A comparison of the known test methods was carried out mainly on PVC containing plasticizers, and various additives to increase the flame resistance. The classification of phosphate plasticizers according to their flame-resistant properties always followed the order: tris-(halogen-alkyl-)phosphate; triarylphosphate; trialkylphosphate. In case of inorganic flame retardants, in general, 50% of the antimony trioxide used can be replaced by borate without any decrease in the flame resistance, whereupon the different effects on the thermal stability of PVC when Ba and Zn borate are used reveal a certain action on the flame retardant properties. M.M.M.

N79-21201# Royal Aircraft Establishment, Farnborough (England).
RAIN-EROSION RESISTANT MATERIALS IN AIR AND SPACE TRAVEL
Dec. 1978 17 p refs Transl. into ENGLISH from West German report MBB WF-Information 5/78, 1978 p 2-10
(RAE-Lib-Trans-2003; BR67275) Avail: NTIS HC A02/MF A01

The development of rain erosion resistant protective coatings for radomes is described for use in subsonic applications on aircraft and for supersonic applications on missiles at velocities up to Mach 6. The associated requirements for antistatic, antiflash and ablation on the re-entry of missiles are also considered. Tests (mostly in the USA) are discussed and examples given of suitable materials for each application. Some flight experience with erosion damage sustained on Starfighters of the Federal German Air Force is included. A.R.H.

N79-21202# Royal Aircraft Establishment, Farnborough (England).
LIMITING QUANTITIES OF THE GLASS TRANSITION TEMPERATURE
R. Becker Oct. 1978 23 p refs Transl. into ENGLISH from Plast. Kaut. (East Ger.), v. 25, no. 1, 1978 p 1-5
(RAE-Lib-Trans-1992; BR66538) Avail: NTIS HC A02/MF A01

The relative importance of several properties, including heat capacity, cohesive energy, free volume and chain rigidity, in determining the value of the glass transition temperatures of polymers is reviewed in the light of new and previous relationships. Equations are developed showing the interrelationship between dominant parameters. Author

N79-21203# Royal Aircraft Establishment, Farnborough (England).
DETERMINATION OF HYDROXYL GROUPS IN EPOXY AND POLYOXPHENYLENE RESINS BY GASOMETRIC METHOD
Feliksa Majewska and Zdzislawa Glinka Nov. 1978 11 p refs Transl. into ENGLISH from Polimery (Warsaw); v. 19, no. 12, 1974 p 622-624
(RAE-Lib-Trans-1990; BR67086) Avail: NTIS HC A02/MF A01

The experimental details for the determination of hydroxyl groups in epoxy and polyoxyphenylene resins are described. The method is based on the quantitative reaction of hydroxyl groups with lithium aluminium hydride, and the measurement of the hydrogen released. This avoids the difficulty of other methods whereby the epoxy groups react with the reagent employed. This method also uses simpler apparatus and techniques compared to other utilizing the same basic reaction. L.P.

N79-21204*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF OXYGEN-NITROGEN RATIO ON SINTERABILITY OF SIALONS
Alan Arias Apr. 1979 24 p refs
(NASA-TP-1382; E-9814) Avail: NTIS HC A02/MF A01 CSCL 11B

The effect of varying the sintering temperature and the oxygen to nitrogen ratio (O/N) on the sinterability of Sialons of the formula Si2.55Al0.6OyN4-0.667y was investigated for y between 0.57 and 1.92 (O/N between 0.157 and 0.706). The Sialons reached maximum density on pressureless sintering for 4 hours at about 1760 C in nitrogen. Optimum sinterability with densities up to about 98 percent of theoretical was attained with negligible X-phase in the O/N range from about 0.2 to 0.3. On sintering at approximately 1830 C the Sialons decomposed with evolution of silicon and aluminum. Author

N79-21205*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL STRESS ANALYSIS OF CERAMIC GAS-PATH SEAL COMPONENTS FOR AIRCRAFT TURBINES
Francis E. Kennedy and Robert C. Bill Apr. 1979 22 p refs Prepared in cooperation with Army Aviation Res. and Develop. Command, Cleveland
(NASA-TP-1437; E-9770; AVRADCOM-TR-78-42) Avail: NTIS HC A02/MF A01 CSCL 11B

Stress and temperature distributions were evaluated numerically for a blade-tip seal system proposed for gas turbine applications. The seal consists of an abradable ceramic layer on metallic backing with intermediate layers between the ceramic layer and metal substrate. The most severe stresses in the seal, as far as failure is concerned, are tensile stresses at the top of the ceramic layer and shear and normal stresses at the layer interfaces. All these stresses reach their maximum values during the deceleration phase of a test engine cycle. A parametric study was carried out to evaluate the influence of various design parameters on these critical stress values. The influences of material properties and geometric parameters of the ceramic, intermediate, and backing layers were investigated. After the parametric study was completed, a seal system was designed which incorporated materials with beneficial elastic and thermal properties in each layer of the seal. An analysis of the proposed seal design shows an appreciable decrease in the magnitude of the maximum critical stresses over those obtained with earlier configurations. Author

N79-21206# Bristol Univ. (England). H.H. Wills Physics Lab.
THE PHYSICAL MECHANISMS RESPONSIBLE FOR THE WEATHERING OF EPOXY RESINS AND GFR EPOXY RESINS Final Technical Report, Ser. 1976 - Oct. 1978
T. W. Turner and K. H. G. Ashbee Oct. 1978 35 p
(Grant DA-ERO-76-G-068; DA Proj. 1T1-61102-BH-57)
(AD-A062799) Avail: NTIS HC A03/MF A01 CSCL 11/4

Ultrasonic photoelasticity experiments have been used to detect the occurrence of plasticization of the matrix of polymer matrix composites during water uptake. The experimental program on steel, soda glass, quartz, epoxy resin system 1009, and a polyester resin composite has now been completed and it has been demonstrated that small changes in bulk properties, such as those resulting from plasticization caused by water uptake by epoxies, can be detected and distinguished from localized defects such as cavities. The latter are readily identified by the interference patterns which they generate. A program has been developed to give computed images which closely resemble the fringe systems observed experimentally. A novel experiment, designed to permit precise exploration of the interfacial bond between silica and epoxy resin during water uptake, has been developed. In another experiment, dimensional changes which occur in the matrix of fiber reinforced plastics as water is absorbed, are being mapped by measurement of the stress birefringence in the resin between closely packed fibres. Conclusions are drawn from the work reported herein, and from the work described in the 1st Annual Technical Report, October, 1977. GRA

N79-21207# North Carolina State Univ., Raleigh. Dept. of Chemical Engineering.
SORPTION AND TRANSPORT OF WATER VAPOR IN GLASSY POLYACRYLONITRILE
V. Stannett, M. I. Haider, W. J. Koros, and H. B. Hopfenberg Nov. 1978 21 p refs
(Contract N00014-75-C-0629)
(AD-A062793; TR-4) Avail: NTIS HC A02/MF A01 CSCL 07/4

Sorption data for H2O in glassy polyacrylonitrile(PAN) are presented for a range of relative vapor pressures at temperatures from 20C to 50C. Simple dual mode sorption, involving 'hole-filling' and molecular solution appears to dominate the low activity region of sorption. Based on the clustering analysis suggested by Zimm and Lundberg, pronounced clustering of penetrant appears to occur above a relative pressure of 0.6. The form of the effective concentration-dependent diffusion coefficient for H2O in PAN, determined by analysis of steady state permeation data, suggests that water in the microvoids and clusters has a lower mobility than the molecularly dissolved water in the polymer matrix. Time lag measurements at high upstream realtive water vapor pressures suggest that the transient state permeation has a non-Fickian character due to relaxations which occur slowly to accommodate the clustering process. Author (GRA)

N79-21208# Alabama Univ., University. Dept. of Chemistry.
COMPARISON OF THE PHOTOCATALYTIC BEHAVIOR OF PHOSPHINATED POLYMER-ANCHORED IRON CARBONYL SPECIES AND HOMOGENEOUS PHOSPHINE SUBSTITUTED IRON CARBONYL SPECIES: ALKENE ISOMERIZATION AND REACTION WITH TRIALKYLSILANES Interim Technical Report
Robert D. Scanner (MIT, Cambridge), Richard G. Austin (MIT, Cambridge), Mark S. Wrighton (MIT, Cambridge), William D. Honick, and Charles U. Pittman, Jr. 11 Jan. 1979 28 p refs Submitted for publication
(Contract N00014-75-C-0689)
(AD-A063659; TR-22(ONR)) Avail: NTIS HC A03/MF A01 CSCL 07/3

A styrene-1% divinylbenzene resin whose phenyl rings were derivatized with -PPh2 groups serves as an 'anchor' for Fe(CO)(n)(n = 3,4) groups; the anchor is the Fe-P bond. The photocatalytic activity of suspensions of the polymer-anchored Fe(CO)(n) was compared to homogeneous solutions of Fe(CO)(n)(PPh3)(5-n)(n = 5.4.3). l-Pentene isomerization and reaction with HSiEt3 can be effected with each system. Observed quantum yields for l-pentene isomerization exceed unity for each catalyst precursor and the initial trans- to cis-2-pentene ratio depends on the catalyst procursor. These experiments establish the viability of photogenerating catalysts anchored to polymer supports without destruction of the anchor bond in the photogeneration procedure. GRA

N79-21209# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
ON THE MECHANISM OF PRESSURE-INDUCED ENVIRONMENTAL STRESS CRACKING IN POLYSTYRENE
Abdelsamie Moet and Eric Baer 22 Dec. 1978 41 p refs
(Contract N00014-75-C-0795)
(AD-A063596; TR-7) Avail: NTIS HC A03/MF A01 CSCL 20/11

Fluids conventionally classified as 'inert' exerted a strong stress crazing and cracking effect on certain amorphous polymers when they are deformed in tension under pressure. Fourier transform infrared difference spectroscopy has been utilized to measure the concentration of trace amounts of fluid penetrating the polymer during deformation. Measurable fluid penetration was found to take place only in dilated structures as large as crazes. The penetration level depended upon craze density and structure, viscosity of the fluid and the time or rate of the experiment. At atmospheric pressure, the penetrating fluid front lagged behind the dry growing craze tip. Radial concentration distributions were successfully described by a semiquantitative porous transport model which yielded a specific penetration coefficient. This coefficient was a strong function of the hydrostatic pressure and the viscosity of the penetrating fluid. It is suggested that the hydrostatic pressure decreases the 'void' content in the polymeric solid, yet due to the pressure gradient concurrently enhances the dynamics of fluid transport. At a critical pressure, the polymer undergoes the brittle-to-ductile transition.

Here irreversible deformation by shear is preferred over the void forming craze or cracking mechanism. Author (GRA)

N79-21210# Lehigh Univ., Bethlehem, Pa. Materials Research Center.

FATIGUE CRACK PROPAGATION IN CRYSTALLINE POLYMERS: EFFECT OF MOISTURE IN NYLON 66 Interim Report

P. E. Bretz and R. W. Hertzberg Dec. 1978 33 p refs (Contract N00014-77-C-0633)

(AD-A063715; TR-2) Avail: NTIS HC A03/MF A01 CSCL 11/9

As part of a study of the effects of crystallinity on fatigue crack propagation (FCP) behavior in crystalline polymers, the FCP response of nylon 66 was examined as a function of both stress intensity factor range (delta K) and water content. It was found that FCP rates were exponential functions of delta K, as expected. However, the FCP rates at constant delta K decreased as the water content was increased to about 3%; at saturation (8% water), the FCP rates were higher than that observed in dry specimens. Results were interpreted in terms of the incorporation of tightly bound water up to a maximum of one water molecule per two amide groups (at approx. 2% water), followed by the incorporation of loosely bound water (at saturation). The tightly bound water evidently toughens the polymer, while the loosely bound water has a predominantly weakening effect. Examination of fracture surfaces revealed a transition from terminal unstable crack growth (at water contents up to 3% to tearing (at saturation). Classical fatigue striations were observed only in the specimens containing 2% water--the first time such striations have been unequivocally identified for any crystalline polymer. Author (GRA)

N79-21211# National Technical Information Service, Springfield, Va.

REINFORCED PLASTICS. PART 1: FIBERGLASS REINFORCEMENT, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - 1976

Diane M. Cavagnaro Mar. 1979 220 p

(NTIS/PS-79/0094/7) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

The bibliography discusses fiberglass reinforced plastics in many different aspects. The citations cover the mechanical and physical properties, bonding, lamination, design, and test methods. They include fabrication and processing of these materials for aircraft, spacecraft, ship hulls, automobiles and flywheels. Some of the plastic matrices that are covered include epoxy resins, polyamide resins, polyesters, polyamides, and polyurethanes. This updated bibliography contains 214 abstracts, none of which are new entries to the previous edition. GRA

N79-21212# National Technical Information Service, Springfield, Va.

REINFORCED PLASTICS. PART 1: FIBERGLASS REINFORCEMENT, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1977 - Feb. 1979

Diane M. Cavagnaro Mar. 1979 84 p Supersedes NTIS/PS-78/0090; NTIS/PS-77/0068; NTIS/PS-76/0063; NTIS/PS-75/109

(NTIS/PS-79/0095/4; NTIS/PS-78/0090; NTIS/PS-77/0068; NTIS/PS-76/0063; NTIS/PS-75/109) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

The mechanical and physical properties, bonding, lamination, design, and test methods for fiberglass reinforced plastics are covered. Studies on fabrication and processing of these materials for aircraft, spacecraft, ship hulls, automobiles and flywheels are covered. Plastic matrices include epoxy resins, polyimide resins, polyesters, polyamides, and polyurethanes. This updated bibliography contains 78 abstracts, 33 of which are new entries to the previous edition. GRA

N79-21213# National Technical Information Service, Springfield, Va.

REINFORCED PLASTICS. PART 2: BORON, CARBON, AND OTHER REINFORCING MATERIALS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1976 - 1977

Diane M. Cavagnaro Mar. 1979 194 p

(NTIS/PS-79/0096/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

This bibliography discusses plastics with reinforcing materials such as carbon and boron. Citations on fabrication, lamination, mechanical properties, stress analysis and viscoelasticity are covered. The studies pertain to reinforced epoxy, polyimide, polyester, and phenolic matrices. This updated bibliography contains 188 abstracts, none of which are new entries to the previous edition. GRA

N79-21214# National Technical Information Service, Springfield, Va.

REINFORCED PLASTICS. PART 2: BORON, CARBON, AND OTHER REINFORCING MATERIALS, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1978 - Feb. 1979

Diane M. Cavagnaro Mar. 1979 109 p Supersedes NTIS/PS-78/0091; NTIS/PS-77/0070; NTIS/PS-76/0064; NTIS/PS-75/110

(NTIS/PS-79/0097/0; NTIS/PS-78/0091; NTIS/PS-77/0070; NTIS/PS-76/0064; NTIS/PS-75/110) HC $28.00/MF $28.00 CSCL 11D

Studies on reinforced epoxy, polyimide, polyester and phenolic matrices are covered. Polymers for reinforced plastics are also described. Citations on fabrication, lamination, mechanical properties, stress analysis and viscoelasticity are included. Reinforced plastics for aircraft and spacecraft applications are also cited. This updated bibliography contains 103 abstracts, all of which are new entries to the previous edition. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N79-21215 Notre Dame Univ., Ind.

CATALYTIC EFFECT OF Ni AND K2CO2 IN THE GASIFICATION OF CARBON AND COAL Ph.D. Thesis

Guillermo Leon GuzmanR 1979 216 p

Avail: Univ. Microfilms Order No. 7908378

The catalytic effect of nickel and K2CO3 on the gasification of activated carbon and Illinois Number 6 coal was studied at atmospheric pressure and temperatures between 500 to 927 C, using a Cahn RG electrobalance. Nickel was a very active catalyst in the gasification of activated carbon, producing CH4 in hydrogasification and mainly CO2 and CO in steam gasification. In coal, nickel exhibited very low activity, probably due to sulphur poisoning. The catalytic effect of K2CO3 on the steam gasification of activated carbon and coal was investigated. K2CO3 is a good catalyst in both carbon samples but its activity was less than the activity observed for nickel in activated carbon. Unlike nickel, K2CO3 is not deactivated by the sulphur content of the coal and can be recovered from the remaining ashes. Dissert. Abstr.

N79-21216 Pennsylvania State Univ., University Park.

MATHEMATICAL TREATMENTS OF SOME PROBLEMS IN FUEL SCIENCE: RESIDENCE TIME DISTRIBUTION IN MILLS; NON-FIRST-ORDER GRINDING EFFECTS; AND CALCINATION Ph.D. Thesis

Thomas James Trimarchi 1978 261 p

Avail: Univ. Microfilms Order No. 7909142

A methodology is developed for determining the residence time distribution of a grinding mile from experimental results. The methodology developed treats both the diffusion and the tanks-in-series models. A method of determining the coefficient of a model which describes the grinding of a material which breaks in a non-first-order manner is developed. The model describes the experimental data as if it resulted from a series of first-order breakage rates. The calcination of limestone was studied. Several simple shrinking coal models for the calcination of limestone spheres existed, but none of them could adequately match experimental data. No fit of the data was possible unless the thermal conductivity of the newly formed layer of calcium

oxide varied as a function of both time and temperature after formation. A method of determining this variation was developed. Dissert. Abstr.

N79-21217*# National Aeronautics and Space Administration, Washington, D. C.
DEPENDENCE OF THE POUR POINT OF DIESEL FUELS ON THE PROPERTIES OF THE INITIAL COMPONENTS
V. M. Ostashov and S. A. Bobrovskiy Apr. 1979 8 p refs Transl. into English of 'Zavisimost' Temperatury Zastyvaniya Dizelnykh Topliv ot Svoystv Iskhodnykh Komponentov", Rept. no. 87 Moskovskiy Inst. Neftekhimicheskoy i Gasovoy Promyshlennostt, Moscow, 1971 p 124-126 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75424) Avail: NTIS HC A02/MF A01 CSCL 21D

An analytical expression is obtained for the dependence of the pour point of diesel fuels on the pour point and weight relationship of the initial components. For determining the pour point of a multicomponent fuel mixture, it is assumed that the mixture of two components has the pour point of a separate equivalent component, then calculating the pour point of this equivalent component mixed with a third component, etc.Author

N79-21218# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
APPLICATION OF ENERGY DISPERSIVE X-RAY FLUORESCENCE SPECTROSCOPY TO THE ANALYSIS OF CONTAMINANTS IN FUELS AND LUBRICANTS Interim Report
Marvin K. Greenberg and Frank M. Newman Nov. 1978 14 p refs
(Contracts DAAG53-76-C-0003; DAAK70-78-C-0001)
(AD-A062792; AFLRL-102) Avail: NTIS HC A02/MF A01 CSCL 21/4

A rapid and inexpensive X-ray fluorescence spectroscopic method for the analysis of particulate contaminants was developed. The method employs the collection of the particulates by filtration followed by X-ray fluorescence analysis of the filter. A unique method for the preparation of standard materials on filters for calibration of the X-ray spectrometer was developed. Linear response over 2 orders of magnitude is routine. The sensitivity is in the parts per million range. The precision and accuracy is about 3 to 5 percent. The method is currently being used to determine contamination in fuels and to correlate the contamination and wear metal particulates in lubricants with engine wear. A large number of turbine fuels and lubricants were analyzed and the data obtained were correlated to field performance. Author (GRA)

N79-21219*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
TNT EQUIVALENCY OF COMPOSITION A5 Final Report
G. L. McKown, F. L. McIntyre, J. Moroney, and W. Badowski Dover, N. J. Army Armament Res. and Develop. Command Sep. 1978 60 p refs
(MIPR-816B602101F4W5)
(NASA-TM-72503; AD-A063519; AD-E400219; ARLCD-TR-78018) Avail: NTIS HC A04/MF A01 CSCL 19/1

Peak blast overpressure and scaled positive blast impulse have been measured for Composition A5 using configurations that simulate bulk handling of material during processing and shipment. Quantities of 11.34, 22.7, and 27.22 kg (25, 50, and 60 lb, respectively) were tested in orthorhombic fiberboard boxes, and 68.04 kg (150 lb) were detonated in cylindrical fiber containers. High-explosive equivalency values for each test series were obtained as a function of scaled distance by comparison to known pressure, arrival time and impulse characteristics for hemispherical TNT surface bursts. The equivalencies were found to depend significantly on scaled distance with higher values (140 to 500%) at the extremes within the range from 1.19 to 15.87 m/cube rt. (Kg) ((3 to 40 ft/cube rt. (lb)), respectively. Equivalencies as low as 100% were obtained at intermediate distances. Within experimental error, both peak overpressure and positive impulse scaled as a function of charge weight for all quantities tested in the orthorhomic configuration. Author (GRA)

N79-21220# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
A CALORIMETER DESIGNED TO DETERMINE THE HEAT-OF-REACTION OF BETA-HMX AS A FUNCTION OF PRESSURE
R. W. Velicky Oct. 1978 19 p
(AD-A063601; AD-E400240; ARLCD-TR-78039) Avail: NTIS HC A02/MF A01 CSCL 14/2

A constant volume - 'constant pressure' combustion calorimeter for measuring the heat generated by burning small samples of explosives at any fixed test pressure to 68,900 kPa (10,000 psi) is described. The heat-of-reaction measurement is determined within 345 kPa (50 psi) of the test pressure. The explosive beta-HMX is shown to undergo a reaction transition between 20,700 and 34,500 kPa (3000 and 5000 psi) during which its heat-of-reaction (Q) increases 427000 J/kg (102 + or - 6 cal/g). This transition occurs in the same pressure region as the discontinuity in burning rate previously observed for experimental gun propellants containing this explosive. The presence of this transition may lead to an explanation of this phenomenon. Author (GRA)

N79-21221# Southwest Research Inst., San Antonio, Tex.
EXPLORATORY STUDY OF M-1 PROPELLANT DUST EXPLOSIBILITY Final Report
J. William Gehring, Gerald J. Friesenham, R. M. Rindner (Army Armament Research and Development Command, Dover, N. J.), and W. Seals (Army Armament Research and Development Command, Dover, N. J.) Sep. 1978 79 p refs
(Contract DAAA21-76-C-0255)
(AD-A063520; AD-E400214; ARLCD-CR-78022) Avail: NTIS HC A05/MF A01 CSCL 19/4

Realizing the serious potential hazards of dust particles generated when drying propellants, particularly in the new Continuous Automated Single Base Line (CASBL) facilities being erected, the Manufacturing Technology Division of ARRADCOM initiated a three-pronged attack to examine the problem. SwRI was charged to concentrate on the explosibility of M-1 propellant dust and, through a brief cursory set of experiments, to determine the minimum energy of electrostatic discharge to induce an explosion; the minimum explosible dust concentration; and the effect of moisture, solvent, temperature and particle sizes upon the explosion threshold value of each of three M-1 propellant concentrations. The result of this exploratory study of M-1 propellant dust explosibility was most definitive in that it demonstrated that severe flash fires and explosions can be initiated under certain sets of ambient conditions. Because of the exploratory nature of this study, it was possible only to identify the parameters which contribute to making an M-1 dust fire susceptible to an explosive reaction. Conclusions are drawn from the test program with regard to the minimum ignition energy and the minimum explosive concentrations of M-1 dust and recommendations are made for expanding this exploratory study into a more detailed evaluation. Author (GRA)

N79-21222# Ogden Air Logistics Center, Hill AFB, Utah. Engineering Div.
COLD WEATHER ENVIRONMENTAL GROUND STARTING TEST USING JPT-8 IN EGLIN CLIMATIC CHAMBER Report, 12 Jun. - 18 Aug. 1978
T. Mitsunaga 25 Oct. 1978 88 p
(AD-A063377) Avail: NTIS HC A05/MF A01 CSCL 21/5

The purpose of the ground test was to determine if there was any degradation to the F-4 ground start during cold weather with the aircraft serviced with JP-8 fuel. Also, several proposals for improving the F-4 low temperature starting capability were tested. Various combinations of fuel, JP-4 and JP-8, and engine specific gravity settings, .78 and .82 were tested to simulate actual field situations. GRA

N79-21223# National Technical Information Service, Springfield, Va.
SYNTHETIC FUELS: METHANE. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jan. 1979
Diane M. Cavagnaro Feb. 1979 269 p Supersedes NTIS/PS-78/0054
(NTIS/PS-79/0030/1; NTIS/PS-78/0054) Avail: NTIS

HC $28.00/MF $28.00 CSCL 21D

The production of methane is discussed in this bibliography containing worldwide citations. The reports pertain to the manufacturing processes, equipment used, performance, economics, and combustion technology. Many of the studies cover the production of methane from wastes, especially agricultural wastes. GRA

N79-21224# Battelle Columbus Labs., Ohio.
PRELIMINARY ENVIRONMENTAL ASSESSMENT OF BIOMASS CONVERSION TO SYNTHETIC FUELS Report for Jul. 1976 - Dec. 1976
S. T. DiNovo, W. E. Ballantyne, L. M. Curran, W. C. Baytos, and K. M. Duke Oct. 1978 366 p refs
(Contract EPA-68-02-1323)
(PB-289775/9; EPA-600/7-78-204) Avail: NTIS HC A16/MF A01 CSCL 21D

A preliminary evaluation of biomass production and conversion technologies, and their associated environmental consequences is presented. Five categories of biomass production were considered in detail. Thermochemical and biochemical technology were considered for conversion processes. Regionalized scenarios were prepared using commercial scale plants processing appropriate regionalized feedstock. Most processes use heterogeneous solid waste as a feed stock which are believed to pose more severe control requirements for emissions and effluents than other biomass feedstocks. The environmental and socio-economic effects of locating large conversion plants in rural environments need to be studied. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N79-21225* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW HEAT LEAK CONNECTOR FOR CRYOGENIC SYSTEM Patent
Philip D. Stelts, inventors (to NASA) (Air Products and Chemical Inc., Philadelphia) Issued 2 Nov. 1965 6 p Filed 1 Oct. 1964 Sponsored by NASA
(NASA-Case-XLE-02367-1; US-Patent-3,215,313;
US-Patent-Appl-SN-400857; US-Patent-Class-222-131) Avail: US Patent and Trademark Office CSCL 20L

Heat leak from the surrounding atmosphere during fluid transfer from a spaced shell-insulated vessel for storing liquified gas having an upper gaseous phase, in minimized by forming a relatively wide, shallow blister on the wall of the vessel at the point of transfer line connection. The shell and the opposed walls of the blister have aligned openings whose common axis passes centrally through the blister and is normal to the surfaces of the vessel and shell. A fluid transfer line conduit passing through the shell opening is in fluid-tight connection with the shell and blister wall. The fluid transfer line confines the fluid in a continuous stream. The blister is filled with a heat insulating material which provides a thermal break between the central wall portions of the blister. A connector at the bottom of the vessel comprises a tube extending between the openings in the blister which projects a short distance within the body of liquefied gas and terminates in a reverse bend to prevent backflow of liquid through the pipe. A.R.H.

N79-21226* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD AND APPARATUS FOR PREPARING MULTICONDUCTOR CABLE WITH FLAT CONDUCTORS Patent
Gerald V. Marcell, inventor (to NASA) (Sheldahl, Inc., Northfield, Minn.) Issued 2 Dec. 1969 4 p Filed 26 Sep. 1966 Sponsored by NASA
(NASA-Case-MFS-10946-1; US-Patent-3,481,802;
US-Patent-Appl-SN-581843; US-Patent-Class-156-52) Avail: US Patent and Trademark Office CSCL 13H

A method and apparatus for preparing flat conductor cable having a plurality of ribbon-like conductors disposed upon and adhesively bonded to the surface of a substrate is described. The conductors are brought into contact with the substrate surface, and while maintained in axial tension on said substrate, the combination is seated on a yieldably compressible layer to permit the conductor to become embedded into the surface of the substrate film.

Official Gazette of the U.S. Patent and Trademark Office

N79-21227* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EDGE COATING OF FLAT WIRES Patent
Gerald V. Marcell (Sheldahl, Inc., Northfield, Minn.), Harold I. Reynolds (Sheldahl, Inc., Northfield, Minn.), and John W. Anderson, inventors (to NASA) (Sheldahl, Inc., Northfield, Minn.) Issued 12 May 1970 4 p Filed 5 Jul. 1966 Sponsored by NASA (NASA-Case-XMF-05757-1; US-Patent-3,511,680;
US-Patent-Appl-SN-562558; US-Patent-Class-117-43) Avail: US Patent and Trademark Office CSCL 13H

An apparatus and technique is described for the coating of the edge surfaces of flat ribbon conductors with an adherent coating of a dielectric insulating material. Means for passing the ribbon conductors between a pair of generally axially aligned rollers is provided. The edge surfaces of the conductor are disposed adjacent to and generally tangentially to the confronting surfaces of the roller so as to form a fillet of dielectric material along the edge surface of the conductor. J.M.S.

N79-21228 Pennsylvania State Univ., University Park.
A NEW APPROACH TO STUDY THE STRUCTURE OF HYDRATED CEMENT PASTES PREPARED BY NORMAL AND HOT PRESSING TECHNIQUES Ph.D. Thesis
Asok Kumar Sarkar 1978 123 p
Avail: Univ. Microfilms Order No. 7909125

When portland cement containing two most important silicate constituents, tricalcium silicate and b-dicalcium silicate reacts with water, poorly crystaline C-S-H gel was formed. This C-S-H gel was responsible for most of the strength bearing characteristics of the cement pastes. It was not possible to determine the true crystal chemical nature of the C-S-H gel by conventional methods due to its noncrystallinity. However, end-blocking of reactive hydroxyl groups, a technique which stabilizes the dissolved silicate species, can be used to make inferences about the solid structure of the starting cementitious materials, as well as the gel from the study of species in soution. On the basis of this type of characterization, a polymerization theory was propounded for cement hydration processes. According to this theory, individual SIO4 tetrahedra from the original silicates gradually join together during the hydration process forming oligomers of silicate anions, analogous to the process of hardening of plastics. Dissert. Abstr.

N79-21229 Northwestern Univ., Evanston, Ill.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF NONLINEAR TRIAXIAL BEHAVIOR AND CREEP OF CONCRETE Ph.D. Thesis
Sang-sik Kim 1978 161 p
Avail: Univ. Microfilms Order No. 7907896

The inelastic behavior of concrete is investigated. Several distinct, but interrelated aspects of the problem are studied, including triaxial nonlinear behavior, nonlinear time-dependent creep, as well as the effects of aging and high temperature. A comprehensive constitutive relation for short-time nonlinear triaxial deformations of concrete is derived by combining plastic stress decrements and fracturing stress decrements. The model describes the degradation of elastic moduli, the failure envelopes for multiaxial loading, volume changes and hydrostatic response. The predictions of the model are path-dependent. A type of hardening, called jump-kinematic hardening, is used to extend the theory to cyclic loading. Subsequently, a nonlinear creep equation is investigated in order to model the adaptation to compression, acceleration of aging, and the plastic flow at high stress.

Dissert. Abstr.

N79-21230 New Mexico State Univ., University Park.
DEFORMATIONAL BEHAVIOR OF PLAIN CONCRETE SUBJECTED TO BIAXIAL-CYCLICAL LOADING Ph.D. Thesis
Abdulmajeed Abbas Jeragh 1979 143 p
Avail: Univ. Microfilms Order No. 7907708

A study of concrete stress states was carried out using a

triaxial testing machine to: study experimentally the behavior of plain concrete subjected to cyclical loading in uniaxial and biaxial states of stress; and to determine the applicability of the testing machine to study the behavior of plain concrete under these loading conditions. The three-inch cube specimens were subjected to prescribed stress histories. In addition to the uniaxial state of stress, biaxial stress states of two types were studied. The cyclical loading ranged from zero to various percentages of the unconfined static strength of the cube. Strain measurements in all three principal directions were recorded for each test. The effects of number of cycles, load paths and state of stress on the dilatational, as well as stress-strain response for plain concrete are shown. A set of S-N curves showing the effect of load path are discussed. Dissert. Abstr.

N79-21231 Michigan Univ., Ann Arbor.
REINFORCED CONCRETE MEMBERS OF HOLLOW CIRCULAR SECTION UNDER MONOTONIC AND CYCLIC BENDING Ph.D. Thesis
Zamil Abdulrahman Mokrin 1978 208 p
Avail: Univ. Microfilms Order No. 7907140

This research is mainly concerned with experimental studies relative to the ultimate bending capacity and the reversed cyclic moment-curvature relationship of reinforced concrete members of hollow circular sections subjected to both transverse and axial loads. Such sections were encountered in reinforced concrete chimneys, bridge piers, intake-outlet towers and other structures. Four specimens were tested for monotonically increasing bending. Another four identical specimens, except for possible variations in concrete strength, were tested for reversed cyclic bending. The hollow cylindrical specimens were 10 feet long and 16 inches in outside diameter with wall thickness of 2 inches and reinforced by both longitudinal and circumferential steel. Dissert. Abstr.

N79-21232 Northwestern Univ., Evanston, Ill.
PRACTICAL PREDICTION OF TIME-DEPENDENT DEFORMATIONS AND FAILURE OF CONCRETE Ph.D. Thesis
Liisa Kirsti Tellervo Panula 1978 174 p
Avail: Univ. Microfilms Order No. 7907921

The formulas for predicting creep and shrinkage of a concrete of given strength and composition are developed and validated by exhaustive comparison with all comprehensive data sets existing in the literature. A practical model for predicting shrinkage of concrete from the composition of concrete mix, standard strength, conditions of environment, size, shape, etc. is proposed. The double power law is developed as a model for practical prediction of creep at constant humidity and temperature from composition of concrete mix, strength, age at loading and load duration. The model is extended to creep at drying environment and constant temperature. A prediction model is presented for basic and drying creep at various temperatures. Formulas for the cyclic effect on basic and drying creep are presented.
Dissert. Abstr.

N79-21233# Coast Guard, Washington, D.C. Merchant Marine Safety.
LIQUEFIED NATURAL GAS SAFETY RESEARCH OVERVIEW Final Report
Alan L. Schneider Dec. 1978 72 p refs Presented at the LNG Terminal and Safety Symp., San Diego, Calif., 12-13 Oct. 1978; sponsored by the Am. Gas Assoc. and the Cryogenic Soc. of Am.
(AD-A063714) Avail: NTIS HC A04/MF A01 CSCL 21/4

Liquefied Natural Gas (LNG) is a growing factor in the United States energy supply situation, both for periods of high demand, peak shaving, and for daily supply (base load). Safety has been a major issue in its acceptance by the public, the government, and industry. Perhaps because of this, industry and government have undertaken programs of research, development, testing, and evaluation that are more extensive than those for most other new hazardous materials. This paper records the experimental and theoretical work performed with the goal of increasing LNG safety, and has been organized in fourteen divisions; land storage tank studies, rollover, dispersion from spills on land, land spill fire studies, land spill fire protection, ship studies, flameless explosion, dispersion from spills on water, underwater releases, water spill fire studies, vapor cloud deflagration, vapor cloud detonation, physical properties, and gelation. Examining the record of the LNG research effort leads inevitably to the conclusion that there is a basic understanding of the material, sufficient to design, operate, and regulate LNG transportation and storage.
Author (GRA)

N79-21234# Georgia Inst. of Tech., Atlanta.
REPORT ON FIRE DATA COLLECTION AND PRESENTATION
Ronald L. Rardin and Morris Mitzner Jun. 1978 33 p refs (Grant NFPCA-76023)
(PB-288829/5) Avail: NTIS HC A03/MF A01 CSCL 13L

The national fire data collection and classification systems of several countries are examined, including: Austria, Belgium, Canada, France, Japan, Netherlands, Norway, Sweden, United Kingdom, and the United States. Possible standards are identified for five dimensions of fire experience: type of incident, types of fire loss measures, type of occupancy, area of fire origin, and cause of fire. There is, therefore, in the existing commonality of several data elements, a basis for international fire reporting standards. GRA

N79-21235# National Inst. of Building Sciences, Washington, D. C. Building Economics and Regulatory Technology Div.
SOLAR BUILDING REGULATORY STUDY, VOLUME 1 Final Report
Nov. 1978 93 p Sponsored in part by NBS
(Contract EA-77-A-01-6010)
(PB-289823/7; NBS-GCR-78-141-1-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 13A

The results of a project oriented toward obtaining the views of organizations representing diversified interests within the building community are documented. The need for a solar regulatory system, and the form such a system should take if indeed a solar regulatory system were recommended are discussed. GRA

N79-21236# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Civil Engineering.
DISCUSSION ON SOIL RESTRAINT AGAINST HORIZONTAL MOTION OF PIPES; SEISMIC VULNERABILITY, BEHAVIOR AND DESIGN OF UNDERGROUND PIPING SYSTEM
Leon Ru-Liang Wang Jan. 1978 13 p refs
(Grant NSF ENV-76-14884)
(PB-290205/4; NSF/RA-780335; TM-1) Avail: NTIS HC A02/MF A01 CSCL 13K

A systematic way of assessing the adequacy and vulnerability of water/sewer distribution systems subjected to seismic loads and future design methodologies are developed. The current state of knowledge of soil resistance to horizontal pipe motion, known as the soil springs in the analysis is emphasized. For buried piping systems which may involve many nodes and members, discrete springs are not considered to be able to model soil resistance properly for given member and rotations. From an analysis of existing literature, correlations of the soil horizontal resistance to several other basic soil parameters, other than ultimate strength, are made. GRA

N79-21237# National Bureau of Standards, Washington, D. C. National Engineering Lab.
DIMENSIONS/NBS. VOLUME 62, NUMBER 11, NOVEMBER 1978 Monthly Report
Nov. 1978 29 p
(PB-289881/5; NBS-DIM-62-11-Vol-62) Avail: NTIS HC A03/MF A01 CSCL 14B

This monthly magazine features short summaries of major technical developments, highlights of work in progress, major speeches and statements by Bureau management, and a listing of NBS publications. The table of contents for the current issue is: For Good Measure; Probing the Past with Neutrons; Chemical Fingerprints on File; Fibrous Glass Board Standard Reference Material; FAST Facility Available for Engineering Needs; New NBS-NIH Large-Molecule Diffractionmeter, Standard Reference Material for Electron Experiments; Conferences; Publications, and News Briefs. GRA

N79-21238# Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
FACTORS AFFECTING THE STRUCTURAL RESPONSE OF

EMULSIFIED ASPHALT-AGGREGATE MIXTURES Civil Engineering Studies, 1974 - 1976
Michael I. Darter, Patrick L. Wilkey, and Steven L. Ahlfield Mar. 1978 110 p refs Sponsored by DoT and Illinois Dept. of Transportation
(PB-289621/5; UILU-ENG-78-2001; Transportation-Engr-Ser-21; FHWA/IL-78-UI-173) Avail: NTIS HC A06/MF A01 CSCL 13C

An extensive laboratory study was conducted to determine the effects of several factors on the structural response of emulsified asphalt-aggregate mixtures. The major purpose of the study was to develop recommendations for mixture design procedures. Many factors are believed to influence the performance of dense graded emulsified asphalt mixtures in pavement bases, but the following were selected for evaluation in the test series: residual asphalt content, compactive effort, moisture content in compaction, curing time after compaction, and aggregate type. Other factors were also evaluated including moisture content at testing, voids (air plus moisture), total liquid content, and moisture absorbed during a special soak test. Four tests were evaluated including: modified Marshall stability, indirect tensile test resilient modulus, and a moisture absorption test. GRA

N79-21239# Bureau of Mines, Boulder City, Nev. Metallurgy Engineering Lab.
DIRECT SUBSTITUTION OF SULFUR FOR ASPHALT IN PAVING MATERIALS
William C. McBee and Thomas A. Sullivan 1978 30 p refs (PB-290113/0; BM-RI-8303) Avail: NTIS HC A03/MF A01 CSCL 13C

Prompted by forecasts of a sulfur oversupply, the Federal Bureau of Mines is conducting research on potentially large-scale uses of this commodity to extend or place such construction materials as asphalt, cement, and mineral aggregates. Through these efforts, paving materials were developed in which sulfur replaces up to 50 pct of the asphalt normally present and which can be prepared and placed with existing mixing and paving equipment. Laboratory properties and design methods for this direct mixing process are described, along with properties obtained from control materials prepared without sulfur additions. Monitoring for toxic gases during laboratory and commercial mixing and paving operations is also discussed. GRA

N79-21240# North Dakota State Highway Dept., Bismark. Materials and Research Div.
DETERMINATION OF WATER CONTENT OF PLASTIC CONCRETE USING A MICROWAVE OVEN Final Report
Robert T. Peterson and Dave Leftwich Sep. 1978 24 p Sponsored in part by DoT
(PB-290170/0; FHWA/ND-78/4-77B) Avail: NTIS HC A02/MF A01 CSCL 13C

Oven or hot plate drying is unsatisfactory because the heat involved hastens cement hydration which makes a portion of the water nonevaporable. Drying by microwave oven on the defrost mode was found to essentially overcome this problem. The time interval between introduction of the mixing water and start of the test did not affect the results up to the maximum time interval tested of one hour. The accuracy of the test is such that 95 percent of the time the true water content can be determined to within .06 gallons/sack of cement. It takes about one hour to perform the test. Field trials on four construction projects were successfully accomplished which proved its practicality and value. GRA

N79-21241# Utah Dept. of Transportation, Salt Lake City. Research and Development Unit.
EVALUATION OF SELECTED SOFTENING AGENTS USED IN FLEXIBLE PAVEMENT RECYCLING Final Report, Jun. 1977 - May 1978
Douglas I. Anderson, Dale E. Peterson, Max L. Wiley, and W. B. Betenson Apr. 1978 61 p refs
(Contract DOT-FH-11-8558)
(PB-290184/1; FHWA/TS-9/204) Avail: NTIS HC A04/MF A01 CSCL 13C

Twenty-three softening agents were tested for physical and chemical properties. The agents were very low in viscosity, which seemed to correspond to a low asphaltenes content. Four of these softening agents were selected for detailed evaluation on two pavements being considered for recycling. Samples containing the four agents were oven aged to evaluate changes in the mix and binder properties. GRA

N79-21242# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Civil Engineering.
INELASTIC RESPONSE OF REINFORCED CONCRETE COLUMNS SUBJECTED TO TWO-DIMENSIONAL EARTHQUAKE MOTIONS
M. I. H. Suharwardy and D. A. Pecknold Oct. 1978 225 p refs
(Grants NSF ENV-75-08456; NSF ENV-77-07190; NSF GI-29934)
(PB-291207/9; STRUCTURAL-RESEARCH-SER-455; UILU-ENG-78-2022) Avail: NTIS HC A10/MF A01 CSCL 13M

The effects of two-dimensional earthquake motion on reinforced concrete (R/C) columns. An analytical model to represent the shear-deflection-axial load relationship of R/C columns is developed from stress-strain relations of steel and concrete. Improved hysteresis model for steel included the Bauschinger effect and the model for concrete included the deterioration of strength and stiffness under cyclic loading. The analytical model predicts significant changes in the strength, energy absorption capacity and accumulated damage responses of the column under biaxial deformations as compared to the corresponding responses under uniaxial deformations. GRA

N79-21992# Joint Publications Research Service, Arlington, Va.
A METHOD OF DETERMINING THE ANGULAR POSITION OF OBJECTS
K. L. Kulikovskiy and A. I. Shimarov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 63 (JPRS-73084) 26 Mar. 1979 p 39-43 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), no. 11, 1978 p 116-120 (For primary document see N79-21989 12-99)
Copyright. Avail: NTIS HC A04/MF A01

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N79-21243 Wayne State Univ., Detroit, Mich.
THE 79 GHz MICROWAVE TRANSMISSION SPECTROSCOPY OF COPPER AND ALUMINUM Ph.D. Thesis
Tzu-Min Hsu 1978 148 p
Avail: Univ. Microfilms Order No. 7908923

The conduction spin resonance (CESR) signal is studied in crystalline and polycrystalline copper. The CESR line width in copper is observed to be temperature dependent. The line widths and g values found in copper are in good agreement with the Fredkin-Freedman (F-F) model. Aluminum exhibits a behavior similar to that of copper, except that the g value shift is about three times larger and in the opposite direction. The data from the aluminum experiment do not agree with the F-F model. The observed low temperature line width varies linearly with frequency. A new model is needed to explain these anomalous effects. Spin wave excitation are observed in aluminum at 79 GHz. The existence of the spin-wave mode on the low field side of the CESR shows that the coupling parameters, B, is positive. An exact description of spin waves for the case of anisotropic g value is lacking. The results are compared with the isotropic system. Dissert. Abstr.

N79-21244 Arizona Univ., Tucson.
AN EVALUATION AND COMPARISON OF SEVERAL MEASURES OF IMAGE QUALITY FOR TELEVISION DISPLAY Ph.D. Thesis
Harry Lee Task 1978 155 p
Avail: Univ. Microfilms Order No. 7908371

A target detection and target recognition study was

implemented to determine which of the 19 figures of merit correlated highest with performance. A 525 line, 60 Hz field rate television display system with 2:1 interlace of fields was used. Nine different display quality conditions were investigated using all combinations of three contrast ratios (50:1, 50:5 and 50:15) and three video bandwidths (6.0 MHz, 1.0 MHz and 0.4 MHz). Noise was not varied. Three FOM's stood out as promising indicators of display quality and observer performance. The highest correlating FOM was the log band-limited modulation transfer function area (log BLMTFA) closely followed by the just-noticeable difference area-log (JNDA-log, 1/2 cpd)and the JNDA-log, 2cpd. Dissert. Abstr.

N79-21245 Ohio State Univ., Columbus.
SURFACE WAVES ON PERIODIC HORIZONTAL STRUCTURES OVER A FLAT EARTH Ph.D. Thesis
Hung Ban Tran 1978 127 p
Avail: Univ. Microfilms Order No. 7908227

An analytic theory is presented for the surface waves supported by three types of transmission lines: a Goubau line (C-line), a coaxial line with periodic 360 deg circumferential slots (C-line) and a coaxial line with periodic partial circumferential slots (R-line), in free space as well as in the presence of a lossy flat earth. The theory for the surface waves on an R-line centered in a cylindrical tunnel with earth walls is also derived. A transcendental equation is derived for each of the three lines in free space to determine complex propagation constants gamma = alpha + j beta of the surface waves. For the C- and R-lines, suitable trial functions are chosen for the aperture field distribution in the slots. Numerical results for the C-line agree closely with published results. No comparable check data were found in the literature for the C-line or R-line although certain internal consistency tests were verified. Dissert. Abstr.

N79-21246 State Univ. of New York at Stony Brook.
MULTIPLE ACCESS COMMUNICATION USING TREE CODES Ph.D. Thesis
Dipankar Raychaudhuri 1978 146 p
Avail: Univ. Microfilms Order No. 7908637

Certain tree coded multiple access (TCMA) communication techniques were proposed, and their performance was evaluated for various multiaccess configurations. These TCMA schemes possess desirable properties that are characteristic of spread spectrum (SSMA) systems, but with a greater bandwidth efficiency than conventional SSMA. The study of TCMA begans by extending previous results on the error performance of orthogonal tree codes in two directions; first, to alternative receiver structures, and then to the use of quasi-orthogonal signals in place of orthogonal ones. Formulas, permitting computation of packet error probability for othogonal and quasi-orthogonal tree codes using variety of detection schemes, were developed. Two distinct techniques which employ tree codes for simultaneous communication over a common wideband channel were introduced.
Dissert. Abstr.

N79-21247# Royal Aircraft Establishment, Farnborough (England).
NEAR FIELD PROBLEMS WITH HIGH POWER TRANSMITTERS
Joachim Kaiser Jul. 1978 20 p refs Transl. into ENGLISH from Rundfunk-Tech. Mitt. (West Ger.), v. 19, no. 1, 1975 p 23-30
(RAE-Lib-Trans-1982; BR65966) Avail: NTIS HC A02/MF A01

Unwanted interactions between the electromagnetic field radiated from a transmitter and the environment are discussed for the MW frequency range. Dangers occurring in the near field of the transmitter include: the direct radiation effect of radiation on the human body; unacceptable interference voltages produced in electrically conductive structures in the transmitter's radiation field; detonation of explosive substances and mixtures; and interference to electrical and electronic equipment. The very presence of structures can also disturb the transmitter's radiation pattern. Methods for protecting property adjacent to a transmitter are included. A.R.H.

N79-21248# Williston, McNeil and Associates, Lakewood, Colo.
A TIME DOMAIN SURVEY OF THE LOS ALAMOS REGION, NEW MEXICO
Los Alamos, N. Mex. LASL Jan. 1979 51 p ref
(Contract W-7405-eng-36)
(LA-7657-MS) Avail: NTIS HC A04/MF A01

A time domain electromagnetic sounding survey of the region surrounding the city of Los Alamos, New Mexico was carried out. The results show that a linear through, trending northeast-southwest runs beneath the city. The southern boundary is somewhat to the south of the city, the northern boundary was not established. The geoelectric section consists of three layers and the total thickness of the section is in excess of 3,000 m. The resistivities of the second layer are as low as 2.5 ohms m. If the salinities are in the region of 7,000 ppm, the resistivities could indicate that water with a temperature of 150 C may be found at a depth of 3,000 m. Author

N79-21249*# Fairchild Imaging Systems, Syosset, N. Y.
ENVIRONMENTAL PERFORMANCE EVALUATION OF AN ADVANCED-DESIGN SOLID-STATE TELEVISION CAMERA Final Report
Feb. 1979 123 p
(Contract NAS9-15407)
(NASA-CR-160158; ED-AX-147) Avail: NTIS HC A06/MF A01 CSCL 17B

The development of an advanced-design black-and-white solid-state television camera which can survive exposure to space environmental conditions was undertaken. A 380 x 488 element buried-channel CCD is utilized as the image sensor to ensure compatibility with 525-line transmission and display equipment. Specific camera design approaches selected for study and analysis included: (1) component and circuit sensitivity to temperature; (2) circuit board thermal and mechanical design; and (3) CCD temperature control. Preferred approaches were determined and integrated into the final design for two deliverable solid-state TV cameras. One of these cameras was subjected to environmental tests to determine stress limits for exposure to vibration, shock, acceleration, and temperature-vacuum conditions. These tests indicate performance at the design goal limits can be achieved for most of the specified conditions. Author

N79-21250# Battelle Columbus Labs., Ohio.
KA-BAND RELIABILITY IMPROVEMENT. PART 3: USER'S MANUAL TASA/DEPEND PROGRAM Final Technical Report, 15 Apr. - 15 Jul. 1978
J. E. Drennan and J. L. Easterday Wright-Patterson AFB, Ohio AFAL Sep. 1978 83 p
(Contract F33615-75-C-1208; AF Proj. 1227)
(AD-A062901; AFAL-TR-78-135-Pt-3) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report contains detailed instructions for using the DEPEND computer program to evaluate dependability, availability, reliability and other performance parameters for avionics and other systems and subsystems on aerospace vehicles. The program is run as the evaluation step in a comprehensive system performance analysis. In this manual, extensive computer experience is not assumed, but the user should have a basic knowledge of computer usage, and a technical understanding of the functional relationships among components of the system to be analyzed, and the effect on system, subsystem, and functional assembly performance resulting from malfunctions and failures of the system components. Complete information is given for setting up the input data, obtaining a run and interpreting the results. Figures defining the punch card formats for input data are provided that can be used as data sheets. Examples illustrating the use of the program are also included. The DEPEND program is written in FORTRAN IV language for the CDC Cylber 700, 6000 series and 7000 series computer systems. Author (GRA)

N79-21251# Ohio State Univ. Research Foundation, Columbus.
TDMA TIMING LOOPS FOR HIGH DATA RATE SYSTEMS
W. G. Swarner, C. W. Chuang, R. J. Huff, and H. S. Eilts Griffiss AFB, N.Y. RADC Nov. 1978 194 p refs
(Contract F30602-75-C-0061; AF Proj. 6523)
(AD-A062992; OSURF-710300-1(ESL); RADC-TR-78-2) Avail: NTIS HC A09/MF A01 CSCL 17/2

Optimum linear recursive filtering techniques are applied to achieve system synchronization for a high data rate bit synchronous TDMA satellite or relay communications system employing two

sampled data delay lock loops at each terminal to establish receive clock and transmit timing relative to a system clock at the satellite or relay. It is shown that a system employing an optimum filter in the receive clock loop with open loop coupling to a separate ranging loop for transmit timing can provide synchronization adequate for a 40 Mbit/s system containing highly maneuverable airborne terminals or relays. Filter models for system timing are developed and analyzed, simulation data represented to verify and augment the analytical results, and design curves and equations applicable to receive-only as well as transmit-receive synchronization for systems containing maneuvering terminals or maneuvering relays are given.
Author (GRA)

N79-21252# Pennsylvania State Univ., University Park. Applied Research Lab.
AXISYMMETRIC SCATTERING OF A SPHERICAL WAVE BY A PROLATE SPHEROID
A. Germon May 1978 100 p refs
(Contract N00017-73-C-1418)
(AD-A062989; ARL/PSU-TM-78-174) Avail: NTIS HC A05/MF A01 CSCL 20/1

Theoretical analyses are performed, and numerical results obtained for the axisymmetric scattering of a spherical wave by either a rigid or soft (pressure release) prolate spheroid. In the numerical calculations, the complex far-field reflection factor (ratio of scattered-to-incident pressure) is computed as a function of frequency and observation angle for a 7-to-1 fineness ratio prolate spheroid. Ten different source locations are considered, all of which lie on the axis of symmetry. In addition, the superposition of the incident and scattered fields is investigated for a variety of two-source configurations. In one instance, these two sources are assumed to have equal strengths and to vibrate in phase, while in a second instance they are assumed to be incoherent.
GRA

N79-21253# University of Southern California, Los Angeles. Dept. of Aerospace Engineering.
[DISCRETE TIME NONLINEAR FILTERING PROBLEM] Annual Interim Scientific Report, 30 Sep. 1977 - 29 Sep. 1978
Richard S. Bucy Sep. 1978 4 p refs
(Grant AF-AFOSR-3100-76; AF Proj. 2304)
(AD-A062775; AFOSR-78-1549TR) Avail: NTIS HC A02/MF A01 CSCL 05/2

In the area of finding performance bounds on the nonlinear filtering problem the information rate between the signal at time t and the observation process up to time t has been evaluated for the general discrete time nonlinear filtering problem. This information rate allows a general definition of steady state new stronger lower bounds for the filtering error are derived. In the area of building nonlinear filters the estimated production speed of the two dimensional phase demodulation problem on the Cray 1 is being improved by examining the assembly code generated by the Cray 1 compiler and seeking to improve the running time by changing the Fortran code on the basis of these observations. This latter problem has been extensively investigated on the CDC 7600 and the Star 100, which in fact has lead to incrased understanding of some of the architectural design constraints inherent in the use of these machines on problems requiring large memories (i.e. over 200K decimal). Author (GRA)

N79-21254# AEL Service Corp., Farmingdale, N. J.
ELECTROMAGNETIC RADIATION SYSTEM (EMRS) FOR SUSCEPTIBILITY TESTING Quarterly Report, 1 Jul. - 30 Sep. 1978
Margaretta V. Stone Dec. 1978 10 p refs
(Contract DAAB07-76-C-0332; DA Proj. 1L7-62701-AH-92)
(AD-A063308; AELSC-TR-23-8; CORADCOM-76-0332-8) Avail: NTIS HC A02/MF A01 CSCL 20/3

The function of the Electromagnetic Radiation System (EMRS) is to generate electromagnetic energy so as to produce a constant field strength that can be automatically scanned as a function of frequency. The design objective is to cover the frequency range of 30 hertz to 40 gigahertz with field strength intensities up to 200 volts per meter. This report describes system equipment status and results of performance tests, particularly in the 30 MHz to 60 MHz frequency range. Author (GRA)

N79-21255# SRI International Corp., Menlo Park, Calif.
PROCEEDINGS OF THE STRESS DATA REVIEW MEETING
D. R. McDaniel, comp. Jun. 1978 354 p refs Meeting held at Washington, D. C., 29-30 Nov. 1977
(Contract DNA001-76-C-0223)
(AD-A063393; AD-E300375; DNA-4620T) Avail: NTIS HC A16/MF A01 CSCL 17/2

A stress Satellite Transmission Effects Simulations data review meeting was held at Headquarters DNA on 29-30 November 1977. These proceedings contain the reports of the various stress experiments and program participants as presented at the meeting. Stress was a communications experiment conducted at Eglin AFB during February and March 1977. The purpose of the experiment was to evaluate satellite communication links under artificially produced conditions that simulated many aspects of a post-nuclear-burst environment. This environment was produced by the use of barium plasma clouds in the lower F-region of the ionosphere. Author (GRA)

N79-21256# Woods Hole Oceanographic Institution, Mass.
NOTES ON THE 1978 SUMMER STUDY PROGRAM ON DYNAMO MODELS OF GEOMAGNETISM IN GEOPHYSICAL FLUID DYNAMICS AT THE WOODS HOLE OCEANOGRAPHIC INSTITUTE
Willem V. R. Malkus and Mary Thayer Nov. 1978 176 p refs
(Grant N00014-78-G-0072)
(AD-A063644; WHOI-78-67-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 08/14

This volume contains the manuscripts of research lectures by the eleven fellows of the summer program. Five of the lectures overlap significantly with the central summer theme of geomagnetism. The other six lectures cover a broad range of current G.F.D. topics from collective instability to strange attractors. Several of these research efforts are quite polished and probably will appear in journals soon. The middle half represent reports of sound progress on studies of thesis calibre. But then, a few of the lectures report on only the very first consequences of a novel idea. GRA

N79-21257# Raytheon Co., Bedford, Mass. Missile Systems Div.
DIELECTRIC SPATIAL FILTER EXPERIMENTAL STUDY Final Technical Report, Jan. 1977 - Jan. 1978
Jerome H. Pozgay Nov. 1978 63 p refs
(Contract F19628-77-C-0111)
(AD-A063260; BR10509; RADC-TR-78-248) Avail: NTIS HC A04/MF A01 CSCL 09/5

This report summarizes the experimental investigation of a dielectric spatial filter. The spatial filter was designed under a previous effort. Specifically, the objectives were: To fabricate the spatial filter design under Contract F19628-76-C-0189; to test the completed filter with a linear array of polarization diverse circular elements. With respect to the test program the goal was to provide experimental confirmation of the filter concept and to investigate the array/filter interaction. The results of this study establish the effectiveness of such filters for reduction of sidelobes beyond 10 deg from broadside. Author (GRA)

N79-21258# Mission Research Corp., Santa Barbara, Calif.
ATTENUATION OF EMP IN THE WAVE ZONE DUE TO IMPERFECTLY CONDUCTING GROUND Topical Report, Jan. 1978 - Jun. 1978
Conrad L. Longmire Jun. 1978 35 p refs
(Contract DNA001-78-C-0141)
(AD-A063600; AD-E300407; MRC-R-400; DNA-4634T) Avail: NTIS HC A03/MF A01 CSCL 20/14

Previously, EMP fields from nuclear surface bursts have been extrapolated to points far beyond the source region by use of a multipole extrapolation based on perfect ground conductivity. This report presents a method for correcting the extrapolated fields to account for actual ground impedance. The method is shown to compare favorably with Sommerfeld's solution for a dipole radiating over a flat earth. Author (GRA)

N79-21259# Harry Diamond Labs., Adelphi, Md.
THE MULTIWIRE SHIELDED ARRAY--THEORY AND

CODE
Michael J. Vrabel Oct. 1978 59 p
(DA Proj. 1L1-62120-AH-25)
(AD-A063585; HDL-TR-1873) Avail: NTIS HC A04/MF A01 CSCL 09/1

A shielded multiwire cable theory is presented in support of the Multiple Systems Evaluation Program (MSEP) goal of characterizing EMP penetration sources for Army tactical systems. The development is supported by a preliminary code and a comprehensive program of experimental testing. An existing cable code provides all system EMP and shield penetration interactions restricting the development to the problems unique in transitioning from the single to the multiple wire shielded cable. The approach is based on the solution of the infinite line problem by using electromagnetic theory and a generalization to the finite cable by using electric circuit theory. Author (GRA)

N79-21260# Naval Research Lab., Washington, D. C. Airborne Radar Branch.
CURRENTS ON GENERALIZED YAGI STRUCTURES Final Report
Walter K. Kahn 8 Jan. 1979 33 p refs
(WF1211601)
(AD-A063374; NRL-8277) Avail: NTIS HC A03/MF A01 CSCL 20/14

Characteristics of currents produced on an infinite linear array of parasitic radiators when one of the radiators is excited are found. Yagi antennas use arrays of electric dipoles; detailed analysis and results are given for a generalized Yagi structure in which the dipoles are inclined at an arbitrary angle to the array axis. Calculations are carried out within a network formulation. The integral solution obtained from this formulation is used to demonstrate the interrelation between the properties of the array of radiators excited parasitically or excited as a phased array. The solution simplifies remarkably when the angle of inclination of the dipoles is 54.74 degrees. The surface-wave components and the (feed) correction currents are then explicitly evaluated. Although for conventional Yagi structures surface-wave solutions have been found only for capacitive dipoles, for sufficiently small angles of inclination surface waves can exist on arrays of inductive dipoles. Author (GRA)

N79-21261# General Dynamics Corp., San Diego, Calif. Electronics Div.
WAVE PROPAGATION THROUGH HOLLOW DIELECTRIC SHELLS Final Report
G. Tricoles, E. L. Rope, and R. A. Hayward Nov. 1978 89 p refs
(Contract N00019-77-C-0303)
(AD-A063305) Avail: NTIS HC A05/MF A01 CSCL 20/14

This report describes analyses and experiments on wave propagation through hollow dielectric shells. The purpose was to describe quantitatively the wave process in randomes. Specifically we sought to analyze wavefront structure and to estimate the magnitudes of the elementary waves that combine to form the wavefront. The research applies to the design of new missile radomes, to the analysis of aerodynamic heating on radome performance, and to the development of anisotropic radomes that reduce the polarization dependence of radome performance. GRA

N79-21262# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
COMMAND AND CONTROL RELATED COMPUTER TECHNOLOGY: PACKET RADIO Quarterly Progress Report, 1 Jun. - 31 Aug. 1978
M. Beeler, J. Burchfiel, R. Perlman, W. W. Plummer, and V. Strazisar Jan. 1979 43 p
(Contract MDA903-75-C-0180; ARPA Order 2935)
(AD-A063729; BBN-3961; QPR-15) Avail: NTIS HC A03/MF A01

This document describes progress on development of a packet radio network. Activities reported include work on Station Software and Internetworking Research and Development. Author (GRA)

N79-21263# National Telecommunication Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
ELECTROMAGNETIC GUIDED WAVES IN MINE ENVIRONMENTS: PROCEEDINGS OF A WORKSHOP Interim Report, 2 Feb. - 30 May 1978
James R. Wait, ed. 31 May 1978 333 p refs Workshop held at Boulder, Colo., 28-30 Mar. 1978
(Contract DI-BM-HO-55008)
(PB-289742/9; BM-OFR-134-78) Avail: NTIS HC A15/MF A01 CSCL 08I

The report is a compilation of papers presented and discussed at a workshop held on March 28-30, 1978, at the Institute of Telecommuncation Sciences on the general subject of mine communications. Active workers from the United States, Canada, England, France, Belgium, South Africa, and Japan were invited to present their latest research results and exchange views. An edited record of the discussions that followed the presentations is included. GRA

N79-21471*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
MINIATURE INTERFEROMETER TERMINALS FOR EARTH SURVEYING
Charles C. Counselman, III and Irwin I. Shapiro *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 65-85 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 17B

N79-21498*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
INTERPRETATION OF ALTIMETER DATA
Micheline C. Roufosse *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 261-266 refs (For primary document see N79-21460 12-42)
(Contract F19628-78-C-0003)
Avail: NTIS HC A16/MF A01 CSCL 17B

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N79-21264* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STABLE SUPERCONDUCTING MAGNET Patent
Roger W. Boom, inventor (to NASA) (Rockwell Intern. Corp., Canoga Pk., Calif.) Issued 21 Mar. 1967 5 p Filed 26 Jul. 1965 Sponsored by NASA
(NASA-Case-XMF-05373-1; US-Patent-3,310,765; US-Patent-Appl-SN-474815; US-Patent-Class-335-216) Avail: US Patent and Trademark Office CSCL 09A

Operation of a superconducting magnet is considered. A method is described for; (1) obtaining a relatively high current in a superconducting magnet positioned in a bath of a gas refrigerant; (2) operating a superconducting magnet at a relatively high current level without training; and (3) operating a superconducting magnet containing a plurality of turns of a niobium zirconium wire at a relatively high current level without training. J.M.S.

N79-21265* National Aeronautics and Space Administration. Pasadena Office, Calif.
DYNAMIC CAPACITOR HAVING A PERIPHERALLY DRIVEN ELEMENT AND SYSTEM INCORPORATING THE SAME Patent
Carmi S. Goldstein, inventor(to NASA) (Echo Science Corp., Mt. View, Calif.) Issued 5 Dec. 1967 4 p Filed 16 Jul. 1965 Sponsored by NASA
(NASA-Case-XNP-02899-1; US-Patent-3,356,917; US-Patent-Appl-SN-472643; US-Patent-Class-317-245) Avail: US Patent and Trademark Office CSCL 09A

A capacitor in which one plate or electrode element is vibratable to achieve a variation in capacitance is described. The capacitor includes two spaced stationary elements. The third element is supported at its center and in the form of a thin

diaphragm which is vibrated at its inherent mechanical resonant frequency to achieve a corresponding variation in capacitance between one of the stationary elements and the vibrating diaphragm. J.M.S.

N79-21266 Georgia Inst. of Tech., Atlanta.
LOW VOLTAGE FIELD EMISSION CATHODES FROM EUTECTIC COMPOSITES Ph.D. Thesis
Jae Do Lee 1978 125 p
Avail: Univ. Microfilms Order No. 7907227

A technique was developed to fabricate low voltage field emitter arrays utilizing unidirectionally-solidified, eutectic, oxide metal composites as a substrate. After the composite was processed to produce metal fibers exposed above the oxide matrix, a thin film insulating layer is vapor deposited on the oxide matrix. Over the insulating layer is deposited a metal layer (an extractor grid) and the process produces micron sized holes in the metal layer which are concentric with the fiber tips. The process is flexible enough to allow positioning the height of the metal extractor relative to the fiber tip, provides for variation of extractor hole diameter and allows sharpening of the fiber tip. Sufficient field gradients are produced with the grid biased at 100-200 volts to extract electrons from the fiber tip. Arrays of 100,000,000 electron guns/cm square have produced current densities in excess of 5 A/cm square. Dissert. Abstr.

N79-21267 Missouri Univ. - Columbia.
POWER ELECTRONIC CIRCUIT ANALYSIS USING DIFFERENCE EQUATIONS Ph.D. Thesis
Jordan Brantley Casteel 1978 170 p
Avail: Univ. Microfilms Order No. 7906853

An analysis technique for solving circuits containing periodically operated switches were developed and applied extensively to the analysis of power electronic circuits such as inverters, switching regulators, and rectifiers. The approach made use of the state representation of the circuit during the intervals between the switching of the power devices and used difference equations to relate circuit variables at the switching instants. For many circuits, the combination of these two analysis tools leads to closed-form solutions of the circuits. From these solutions, previously unknown information about the circuits can sometimes be found or more efficient presentation of already known data becomes available to the designer and analyst. Specific examples are given to show the superiority of the new approach to traditional methods for some circuits. Dissert. Abstr.

N79-21268 Pennsylvania State Univ., University Park.
AN EXPERIMENTAL STUDY OF CARRIER GENERATION AND TRAPPING DUE TO SURFACE AND BULK DEFECTS USING METAL-OXIDE-SEMICONDUCTOR CAPACITORS Ph.D. Thesis
Paul David Esqueda 1978 258 p
Avail: Univ. Microfilms Order No. 7909065

A fast transient current measurement technique was developed for the characterization of charge emission from surface states using MOS capacitors excited by a voltage step-function. This technique, in conjunction with a new formulation of the transient majority carrier charge emission process, allows a rapid determination of the density of surface states (Nss), and their capture cross section values (sigma sub n) in preselected regions of the semiconductor band gap. Two such specific regions were considered for the characterization of devices with moderate and low values of Nss. Using room temperature and slightly lower temperature ambients Nss and sigma sub n were determined for the midgap region. A low temperature was used for the determination of the same parameters in a region close to the bottom of the conduction band. Results of thermally stimulated current and low frequency C-V measurements independently confirmed that the results obtained from the transient current measurement are reliable. Dissert. Abstr.

N79-21269 Pennsylvania Univ., Philadelphia.
CURRENTS, FLUX LINKAGES AND ELECTRICAL TORQUES OF A THREE PHASE MACHINE CLOSING ON AN INFINITE BUS AT ANY LOAD ANGLE Ph.D. Thesis
William Laurence Keltz 1978 175 p
Avail: Univ. Microfilms Order No. 7908757

The currents, flux linkages, and electrical torques that result in the early stages of synchronizing a synchronous machine onto an infinite bus were examined. The problem applies primarily to a generator which is at sychronous speed prior to synchronization but which may be out of phase with the system to which it is to be connected. The problem is solved analytically (for small armature resistances) and by a digital computer program. The three phase machine is modeled with one amortisseur in each of the rotor direct and quadrature axes. The analytical results show that there is a net asymmetry in the transient unidirectional torque versus load angle (where load angle is defined as the initial phase angle across the machine breaker just prior to the synchronization attempt) characteristic. The net asymmetry is due primarily to the armature. Dissert. Abstr.

N79-21270 Syracuse Univ., N. Y.
RANDOM TEST GENERATION FOR FAULT DETECTION AND DIAGNOSIS Ph.D. Thesis
Deepak Kumar Goel 1978 260 p
Avail: Univ. Microfilms Order No. 7908534

A method of test generation is developed which aims at: (1) eliminating the golden unit (a random test generation scheme in which the outputs of the golden unit and the circuit under test are compared); (2) minimizing the length of the test sequence; (3) reducing the complexity of deriving the tests; (4) minimizing the chances of making a wrong decision; and (5) minimizing the information required for reaching a decision about the state of the circuit. The testing procedure developed is analogous to the statistical hypothesis testing problem. Tests are derived for four different kinds of faults. The effectiveness of the tests is studied by randomly injecting faults into a circuit. A new testing procedure called the sequential probabilistic testing procedure is developed for the purpose of fault diagnosis. An algorithm is presented for computing the optimal sequential testing procedure for locating a fault. Dissert. Abstr.

N79-21271 Arizona Univ., Tucson.
NEW MULTIFEEDBACK TYPE ACTIVE RC FILTERS Ph.D. Thesis
Gene Ho Sonu 1978 130 p
Avail: Univ. Microfilms Order No. 7908372

The multiple-amplifier type of filters are compared with their prototype filters and with others which are well known and compatible in terms of the number of passive and active elements. Two different nth-order active double-ladder filters are presented which are conceived from the structures of some multiple-amplifier filters introduced earlier. For each ladder filter, a synthesis algorithm is developed to derive the transfer function and a method of analyzing the effect of the gain-bandwidth product of the op amps is presented. These ladder filters are compared with a cascaded higher-order filter in which newly proposed second- and third-order multiple-amplifier filters are cascaded. The sensitivity of active RC filters is reviewed in detail, emphasizing what sensitivity functions should be taken into consideration, why they are chosen, and how they can be calculated for the given filter under study. Dissert. Abstr.

N79-21272 Florida Univ., Gainesville.
LIGHTING RETURN-STROKE MODELS Ph.D. Thesis
Yung-Tao Lin 1978 292 p
Avail: Univ. Microfilms Order No. 7907768

Using the two-station data collected in 1974, 1975 and 1976, both Bruce-Golde and transmission-line models are tested. Because of the deficiencies in both Bruce-Golde and transmission-line models, a new model is proposed. This new model considers the return-stroke current to be composed of three parts: (1) the breakdown pulse current, responsible for the sharp initial peak field, will propagate up the channel according to the transmission-line model; (2) the corona current are due to the flow of previously stored leader charge into the grounded narrow channel core caused by the breakdown pulse; and (3) the uniform current may already flow or start to flow soon after the return stroke begins. Dissert. Abstr.

N79-21273*# Westinghouse Research and Development Center, Pittsburgh, Pa.
DEVELOPMENT AND FABRICATION OF IMPROVED POWER TRANSISTOR SWITCHES Final Report
P. L. Hower and C. K. Chu Jan. 1979 86 p refs

(Contract NAS3-18916)
(NASA-CR-159524) Avail: NTIS HC A05/MF A01 CSCL 09A

A new class of high-voltage power transistors was achieved by adapting present interdigitated thyristor processing techniques to the fabrication of npn Si transistors. Present devices are 2.3 cm in diameter and have V sub CEO (sus) in the range of 400 to 600V. V sub CEO (sus) = 450V devices were made with an (h sub FE)(I sub C) product of 900A at V sub CE = 2.5V. The electrical performance obtained was consistent with the predictions of an optimum design theory specifically developed for power switching transistors. The device design, wafer processing, and assembly techniques are described. Experimental measurements of the dc characteristics, forward SOA, and switching times are included. A new method of characterizing the switching performance of power transistors is proposed.
J.A.M.

N79-21274*# National Aeronautics and Space Administration, Washington, D. C.
GENERALIZATION OF THE MANLEY-ROWE RELATIONS FOR NON-PERIODIC SIGNALS CONSTRAINED IN BANDWIDTH WITH FINITE ENERGY
Peter Proksch Apr. 1979 17 p refs Transl. into ENGLISH from Arch. Elektronik und Ubertragungstechnik (Austria), vol. 32, no. 5/6, 1978 p 199-205 Original language document was announced as A78-37333 Transl. by Sci. Transl. Serv., Santa Barbara, Calif. Orginal doc. prep. by Technical Univ., Vienna
(Contract NASw-3198)
(NASA-TM-75436) Avail: NTIS HC A02/MF A01 CSCL 09C

General relations for the energy spectral densities of nonperiodic signals constrained in bandwidth in nonlinear reactances are derived. It is assumed that the charge-voltage characteristics of the reactances are polynomials. In addition certain conditions for the frequency bands of the signals must be met. By contrast with the Manley-Rowe relations integrals with respect to frequency appear instead of the ratios power over frequency. The integrands are energy spectral densities divided by frequency. For parametric devices inequalities can be derived for the ratios of the energy levels in the different circuits and the limiting frequencies of the energy spectral densities. With these inequalities it is possible to determine limits for the energy levels. Author

N79-21275# Northwestern Univ., Evanston, Ill.
THERMOELASTIC EFFECTS IN SEALS AND BRUSHES Annual Summary Report, Sep. 1977 - Aug. 1978
Ralph A. Burton Sep. 1978 7 p
(Contract N00014-75-C-0761)
(AD-A062776; Rept-5341-427-2) Avail: NTIS HC A02/MF A01 CSCL 09/1

At Northwestern a series of studies have been carried out, pioneering the analysis of thermoelastic instabilities in sliding systems. Such instabilities influence the mild wear/severe wear transition, and participate in other failure modes, of seals and other systems. Findings have been reviewed in the report 'Thermomechanical Effects in Sliding Wear'. Analyses are continuing on seal dynamics, and transient behavior of brushes. Two apparatuses are available and have been used in experiments in the present year. These findings are being summarized in papers and reports presently under preparation. Author (GRA)

N79-21276# ITT Electro-Optical Products Div., Fort Wayne, Ind.
DEVELOPMENT OF 12 MM PROXIMITY FOCUSED TWO-STAGE DIODE Final Technical Report, Oct. 1976 - Nov. 1977
Thomas F. Lynch May 1978 43 p
(Contract DAAK70-76-C-0248)
(AD-A062747) Avail: NTIS HC A03/MF A01 CSCL 09/1

A 12 mm proximity focused double diode and a 12 mm proximity focused triple diode have been designed, fabricated and delivered. Power supplies were designed, fabricated and delivered. All photocathodes on the tubes were S-20 with extended red response. Both input and output faceplates were fiber optics. The 12 mm double diode output fiber optic was an inverter. A special feature of the 12 mm double diode was that it was actually two proximity focused diodes in one tube envelope. This unique design was achieved by transfering a fiber optic containing a phosphor on one side and a photocathode on the other side into the tube envelope forming the center of the double diode. A triple diode was made by placing a single diode in front of a double diode and bonding the two together. The power supplies were miniaturized and all self-contained including batteries. Photocathode sensitivities ranged from 126 micro/lumen to 400 micro a/lumen. Brightness gains of up to 5000 were achieved on the double diodes and over 10000 on the triple diodes. Author (GRA)

N79-21277# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
HUGHES MODEL 914H TWT Final Report
K. W. Arnold Jun. 1978 40 p
(Contract DAAB07-76-C-0015)
(AD-A063527; EDD-W-06767) Avail: NTIS HC A03/MF A01 CSCL 09/1

The primary objective of the 914H program was to design and build a 200 watt CW, PPM focused, coupled cavity TWT operating over the frequency band of 30.0 to 31.0 GHz. This work was related to earlier Hughes developed millimeter-wave tubes, and the design and experience gained on these programs represented the design baseline for the 914H TWT. As part of the early development effort, a study was performed to design the RF circuit and electron gun. Several computer programs were used to define the cavity dimensions and the circuit configuration to optimize efficiency, bandwidth and gain. The RF circuit was cold tested and optimized at X-band and then scaled up to Ka-band. The electron gun design was performed and evaluated in the demountable beam tester. In addition, windows, transformers, PPM focusing, collector and cooling systems were designed during this program. Upon completion of the tube design, two RF tubes were built, tested and delivered. The two 914H TWTs were tested CW and demonstrated excellent beam focusing and RF performance. Power output in excess of 160 watts across the frequency band has been demonstrated on both tubes. Author (GRA)

N79-21278# Hydrotronics, Falls Church, Va.
TIME CONSTANTS AND LEARNING CURVES OF LMS ADAPTIVE FILTERS Final Report, Oct. 1977 - Jun. 1978
M. Shensa 1 Nov. 1978 54 p refs
(Contract N00123-76-C-1937; XF11101100)
(AD-A063317; NOSC/TR-312) Avail: NTIS HC A04/MF A01 CSCL 09/3

This paper treats the convergence of adaptive LMS filters and, in particular, the adaptive line enhancer (ALE). The learning curves of such a filter are a sum of exponentially decaying modes with time constants given by the eigenvalues of the input correlation matrix and the relative initial magnitudes given by the projections of the filter on the eigenvectors. It is shown that, for large filter lengths, a simple correspondence may be set up between the discrete and continuous cases. Indexed by frequency, the eigenvalues of the correlation matrix correspond to the magnitude of the power spectrum, and the projections onto the eigenvectors to the filter transfer function. A detailed analysis is carried out for single pole spectra and evaluated through a computer simulation. In general, the techniques developed provide a physical context, i.e., the signal spectrum, in which to evaluate convergence. Thus, it is possible, with varying degrees of accuracy depending on knowledge of the input spectrum, to predict the convergence behavior of the system in general. Author (GRA)

N79-21279# Naval Research Lab., Washington, D. C. Optical Techniques Branch.
PHOTOCONDUCTIVE CONTROL OF MICROWAVES Interim Report
Alfred P. DeFonzo 21 Sep. 1978 29 p refs
(DARPA Order 3212)
(AD-A063264; NRL-8239) Avail: NTIS HC A03/MF A01 CSCL 09/3

A phenomenological model of microstrip semiconductor modulators has been developed. The fundamental limitations on the device imposed by the photoconductive process were expressed in terms of the product of gain and bandwidth. Based on this analysis, an optical gap modulator was fabricated and

tested. Its performance approached the fundamental limit imposed by the saturation of photoconductive carrier densities resulting from Auger processes. Drift mobility in the space-charge-limited region was measured and the surface mobility of holes in silicon was determined to be 160(sq cm/V-s). It was found that annealing induced photosensitivity in silicon, and associated charges in the dark I-V characteristics are consistent with the Mott-Gurney law. Author (GRA)

N79-21280# Harry Diamond Labs., Adelphi, Md.
REFLEX TRIODE WITH UNIDIRECTIONAL ION FLOW
Alan Bromborsky, Howard E. Brandt, and R. Alan Kehs Oct. 1978 13 p refs
(DA Proj. 1L1-61102-AH-44)
(AD-A063597; HDL-TM-78-22) Avail: NTIS HC A02/MF A01 CSCL 09/1

Experimental results show that the ion beam generated by a simple reflex triode can be made almost totally unidirectional toward the virtual cathode. This flow is accomplished by constructing the triode so that a controlled surface flashover generates plasma on only one side of the dielectric anode foil. Author (GRA)

N79-21281# Michigan Univ., Ann Arbor. Electron Physics Lab.
FREQUENCY CONVERSION IN PUNCH-THROUGH SEMICONDUCTOR DEVICES Interim Technical Report
Patrick J. McCleer Aug. 1978 269 p refs
(Grant DAAG29-76-G-0232)
(AD-A063558; TR-143; ARO-13853.2-EL) Avail: NTIS HC A12/MF A01

The objectives of this investigation are to study the frequency conversion properties of punch-through semiconductor devices and to establish the frequency regions of their potential application as efficient detectors and mixers of information-bearing signals. The physics of two punch-through devices are studied in detail: the three-terminal punch-through transistor and the two-terminal BARITT (barrier injection transit-time) diode. The particle current injection process for both devices is examined and identified as simple diffusion over a potential barrier (exponential injection with respect to the barrier height). Dc and small-signal ac models for both punch-through structure are derived from standard bipolar junction transistor theory by applying a current-dependent, rather than the standard voltage-dependent, boundary condition for the minority carrier concentration at the collector edge of the low-field base region. The small-signal models include carrier transit-time effects in the diffusion-drift, reverse-biased regions of the devices by means of a transit-time factor similar to the factor used in the standard frequency domain analysis of pure saturated drift transit-time diodes. The small-signal noise properties of the BARITT diode are developed employing the same techniques used in the formulation of the BARITT diode circuit model. Both, small-signal impedances predicted by the circuit model and small-signal noise measures predicted by the noise analysis, compare very well with experimentally measured values of typical BARITT structures. GRA

N79-21282# California Univ., Berkeley. Dept. of Physics.
QUASIPARTICLE HETERODYNE MIXING IN SIS TUNNEL JUNCTIONS
P. L. Richards, T. M. Shen, R. E. Harris (NBS, Boulder, Colo.), and F. L. Lloyd (NBS, Boulder, Colo.) Oct. 1978 11 p refs
(Contract N00014-75-C-0496)
(AD-A063503) Avail: NTIS HC A02/MF A01 CSCL 09/4

The rapid onset of quasiparticle tunneling current in superconductor-insulator-superconductor (Josephson) junctions at voltages above 2 delta/e is being used for millimeter wave heterodyne mixing. Junctions with 2 micron diameter and RN = 50 ohms have little capacitive shunting at the signal frequency of 36 GHz. Because there is no series resistance, residual capacitance can be tuned out. Single sideband conversion efficiencies of 0.18 and mixer noise temperatures as low as TM approximately 14K have been observed. Both results agree with shot noise limited mixer theory. Photon assisted tunneling effects are seen which indicate the approach to photon noise limited operation. Author (GRA)

N79-21283# Westinghouse Electric Corp., Horseheads, N. Y. Industry and Government Tube Div.
DEVELOPMENT OF 40 AND 80 mm CAMERA TUBES WITH DEEP ETCH METAL CAP TARGETS FOR SPACE SURVEILLANCE Final Report, 1975 - 1977
V. J. Santilli Jan. 1978 90 p
(Contract DAAK02-75-C-0127)
(AD-A063434) Avail: NTIS HC A05/MF A01 CSCL 09/1

Final technical report summarizes tube design and development program for large format camera tubes capable of high performance. The report describes the results of the two year program relative to number of tubes and tube performance. Large 32 mm silicon diode target performance as part of tube characteristics discussed. Development problems such as photocathode processing and their solution is recorded. The report ends with a profile of tubes through their specification and an overall look at tube life. Author (GRA)

N79-21284# Ballistic Research Labs., Aberdeen Proving Ground, Md.
ANALYSIS OF COUPLING REGION IN TRANSMISSION-LINE ACCELERATORS Final Report, Oct. 1977 - Jun. 1978
J. K. Temperley Nov. 1978 37 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A063463; AD-E430156; ARBRL-TR-02120) Avail: NTIS HC A03/MF A01 CSCL 20/7

A Laplace-transform analysis is presented of an equivalent circuit which represents a pair of asymmetric transmission lines coupled through a reentrant discontinuity. This cavity configuration is applicable for transmission-line accelerator designs. General expressions for the time-dependent open-circuit output voltage are derived. Some numerical examples for specific line geometries are presented. Author (GRA)

N79-21285# Naval Ocean Systems Center, San Diego, Calif.
DETECTION OF SINUSOIDS IN WHITE NOISE USING ADAPTIVE LINEAR PREDICTION FILTERING Technical Report, Oct. 1977 - May 1978
S. T. Alexander, J. R. Zeidler, R. Medaugh (Colorado Univ., Boulder), and M. Shensa (Hydrotronics, Inc., San Diego, Calif.) May 1978 32 p refs
(Contracts N00123-76-C-1937; N00953-77-C-008)
(AD-A063400; NOSC/TR-270) Avail: NTIS HC A03/MF A01 CSCL 09/3

This paper analyzes the detection performance of a data-adaptive detector based on an adaptive linear prediction (ALP) filter incorporating the Widrow-Hoff LMS algorithm. Receiver operating characteristic (ROC) curves are calculated for two distinct adaptive detector implementations for the case of a sinusoid of known frequency but unknown phase embedded in white Gaussian additive noise. Comparative performance curves for adaptive and nonadaptive detector implementations are presented for this classical detection problem. The dependence of detection performance on the frequency resolution and time constant of the adaptive filter is treated. The ROC curves of the adaptive detector are derived for the condition that the ALP filter output statistics are Gaussian and that the magnitude square output has chi-square density with two degrees of freedom. Author (GRA)

N79-21286# General Electric Co., Syracuse, N.Y. Electronics Lab.
RELIABILITY STUDY OF MICROWAVE POWER TRANSISTORS UNDER TRANSIENT AND MISMATCHED LOADS Final Technical Report, Jul. 1976 - May 1978
Donald J. LaCombe, Ronald J. Naster, and Ottorino Nalin Griffiss AFB, N. Y. RADC Nov. 1978 96 p
(Contract F30602-76-C-0302)
(AD-A063364; RADC-TR-78-226) Avail: NTIS HC A05/MF A01 CSCL 09/3

This report presents the results of study of the reliability of current state-of-the-art transistors under non-ideal conditions, including output mismatch, excess collector voltage, and error drive. Four different device types were characterized to determine their electrical performance and junction temperature as a function of collector voltage, drive, and output impedance. Samples of the devices were taken to destruction under extremes of

these variables and analyzed. It was observed that failure occurred when the junction temperatures exceeded a critical value, with the variables giving rise to the excess temperature making little difference. It was concluded that catastrophic failure observed under high collector voltage conditions was probably due to mechanical defects (cracks, lifted metal, etc.) which were propagated in the temperature cycling environment of the life tests. GRA

N79-21287# Telephonics, Huntington, N.Y.
ADVANCED SOLID STATE POWER CONTROLLER DEVELOPMENT. PHASE 1: STUDY REPORT Interim Report, 15 Jul. 1977 - 15 Jun. 1978
R. J. Edwards 15 Sep. 1978 391 p Prepared in cooperation with Douglas Aircraft Co. and Vought Corp.
(Contract F33615-77-C-2017; AF Proj. 3145)
(AD-A063405; AFAPL-TR-78-55) Avail: NTIS HC A17/MF A01 CSCL 10/2

This report documents the results of Phase I of a two phase program to develop a low cost solid state power controller for USAF aircraft. This study investigated various packaging and interface concepts for solid state power controllers. Trade Studies considered cost, complexity, environmental performance, reliability, and maintainability. The impact of the power controller configuration on the aircraft electrical system was determined. Recommendations on three power controller breadboards to be fabricated in Phase II are made. They include a single phase 5 amp 115 VAC, 3-Phase 5 amp 115 VAC, and 5 amp 28 VAC. Author (GRA)

N79-21288# Rockwell International Corp., Thousand Oaks, Calif. Science Center
ION IMPLANTED GaAs POWER FIELD EFFECT TRANSISTORS Final Technical Report, 28 Jul. 1977 - 28 Mar. 1978
R. L. Kuvas, J. A. Higgins, and D. R. Chen Griffiss AFB, N. Y. RADC Nov. 1978 71 p refs
(Contract F19628-77-C-0205; AF Proj. 2305)
(AD-A063397; SC5118.3TR; RADC-TR-78-254) Avail: NTIS HC A04/MF A01 CSCL 09/1

Tailoring of the doping profile has been shown to be a powerful tool in reducing the intermodulation distortion in GaAs power FETs. Reproducible and uniform preparation of the required sophisticated profiles exceeds the present capability of epitaxial techniques, which has motivated the present investigation of fabricating highly linear power FETs by ion implantation. An analytical device model was developed for exploring the relationship between the active layer profile and the intermodulation distortion. These calculations revealed a complex behavior in the variation of the distortion levels due to partial correlation in the contributions due to nonlinear transconductance and output conductance. The device model was used to identify implant doses and energies for approaching an optimum active layer profile. Based on the results, a deep Se implant followed by a shallow Be implant to reduce the doping level close to the surface was used in the device fabrication. The intermodulation distortion of the transistors was measured by the two-tone method. Conventional epitaxial FETs with a flat doping profile were evaluated for comparison purposes. This comparison demonstrated that a 4dB increase in the intercept point for the third order intermodulation product can be realized by using tailored implant profile. The tuning conditions for maximum output power and minimum intermodulation distortion turned out to be virtually identical for the implanted transistors, in contrast to the behavior of conventional devices with flat doping profiles. GRA

N79-21289# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
LINEAR 1 kW MULTITONE TROPOSCATTER TWT Interim Report, 1 May - Aug. 1978
A. L. Rousseau Dec. 1978 19 p
(Contract DAAB07-77-C-2713; DA Proj. 1L7-62705-AH-94)
(AD-A063329; EDD-W-07564; IR-3; DELET-TR-77-2713-3)
Avail: NTIS HC A02/MF A01 CSCL 09/1

This report covers the third triannual effort of a Research and Development program to design, construct, and test an advanced, high efficiency traveling-wave tube designed to amplify multiple signals while minimizing any mixing products which result from non-linear operations. The tube will be operated in the linear region below saturation; tube efficiency will be enhanced by means of a four-stage, depressed collector. During the report period, parts for the electron gun were received. The assembly tooling for fabrication of the gun was designed and ordered. Circuit parts were obtained and matching of the RF circuit was started. The mechanical design of the four-stage collector was continued. A successful electrode-to-ceramic braze was accomplished. Design of the overall packaging was continued. The program has been proceeding very slowly during the last period because of the limited funding and the unexpectedly high cost of the collector. Author (GRA)

N79-21290# JAYCOR, Alexandria, Va.
STUDY ON THE INITIAL DEVELOPMENT OF HIGH-POWER MILLIMETER WAVE SOURCES Final Report
Michael Read and Robert Lucey 1979 55 p refs
(Contract N00014-77-C-0215)
(AD-A063387) Avail: NTIS HC A04/MF A01 CSCL 09/5

Under NRL contract number N00173-77-C-0215, JAYCOR has performed an analytic and experimental study of some of the fundamental aspects of cyclotron masers (gyrotrons). In particular, JAYCOR has designed and tested a high power gyrotron oscillator, and has designed and used a gyrotron testing facility. This report discusses the results of this project in detail. The JAYCOR-NRL contract includes the following work statement: (1) Design and test a 200 kw cyclotron maser testing facility which includes the modulator, pulse transformer, power supply, superconducting magnet, and auxiliary subsystems. (2) Design and test maser components to include the RF interaction structure and output coupling network. (3) Design and test the RF instrumentation package to include a millimeter wave calorimetric load and an output mode analyzer. (4) Test and evaluate the magnetron injection gun to be used in the cyclotron maser. Compare measured performance with theoretical predictions and optimize gun performance. (5) Design and test the RF driver package. Essentially this work statement calls for the design of a laboratory for the testing of cyclotron masers and the design and test of the various components of an initial device. GRA

N79-21291# National Technical Information Service, Springfield, Va.
SCHOTTKY BARRIER DEVICES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - 1978
William E. Reed Feb. 1979 173 p Supersedes NTIS/PS-78/0073; NTIS/PS-77/0089; NTIS/PS-76/0065; NTIS/PS-75/177
(NTIS/PS-79/0045/9; NTIS/PS-78/0073; NTIS/PS-77/0089; NTIS/PS-76/0065; NTIS/PS-75/177) Avail: NTIS HC $28.00/MF $28.00 CSCL 09A

Federally sponsored research reports are cited on the development, fabrication, performance, and applications of Schottky barrier devices. Research on the physics of Schottky barriers is included. Applications cover solar cells, photodiodes, mixers, transistors, image and energy converters, memory devices, signal processors, and infrared devices. This updated bibliography contains 269 abstracts, 16 of which are new entries to the previous edition. GRA

N79-21292# National Technical Information Service, Springfield, Va.
SCHOTTKY BARRIER DEVICES, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1977
William E. Reed Feb. 1979 150 p
(NTIS/PS-79/0046/7) Avail: NTIS HC $28.00/MF $28.00 CSCL 09A

The development, fabrication, performance, and applications of Schottky barrier devices are discussed in abstracts of worldwide reports. Applications cover microwave equipment, logic devices, field effect transistors, photodiodes, surface acoustic wave devices, and solar cells. This updated bibliography contains 144 abstracts, none of which are new to the previous edition. GRA

N79-21293# National Technical Information Service, Springfield, Va.
SCHOTTKY BARRIER DEVICES, VOLUME 4. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress

Report, 1978
William E. Reed Feb. 1979 201 p refs Supersedes NTIS/PS-78/0075; NTIS/PS-77/0091; NTIS/PS-76/0066 (NTIS/PS-79/0047/5; NTIS/PS-78/0075; NTIS/PS-77/0091; NTIS/PS-76/0066) Avail: NTIS HC $28.00/MF $28.00 CSCL 09A

Abstracts of worldwide research reports on the development fabrication, performance, and applications of Schottky barrier devices are presented. Research on the physics of Schottky barriers is included. Applications cover microwave equipment, logic devices, field effect transistors, photodiodes, surface acoustic wave devices, and solar cells. This updated bibliography contains 195 abstracts, all of which are new entries to the previous edition. GRA

N79-21993# Joint Publications Research Service, Arlington, Va.
ON ONE POSSIBILITY OF REALIZING HARMONIC FUNCTIONS IN DISCREETLY CONTROLLED EQUIVALENTS OF ROTARY TRANSFORMERS
B. V. Sychev *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 63 (JPRS-73084) 26 Mar. 1979 p 44-48 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), no. 11, 1978 p 70-74 (For primary document see N79-21989 12-99)
Copyright. Avail: NTIS HC A04/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N79-21294 Engineering Sciences Data Unit, London (England).
GUIDE TO CALCULATION PROCEDURES FOR SOLVING TYPICAL PROBLEMS RELATED TO PRESSURE DROP IN TWO-PHASE FLOW
1978 65 p
(ESDU-78010; ISBN-0-85679-220-9) For information on availability of series, subseries, or individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC E99

This Item is intended for use in conjunction with the ESDU Data Items on two phase flow pressure gradients which present statistically evaluated and corrected correlations of the three components of overall pressure gradient. The solution of two phase flow pressure change and related problems generally involves the integration of locally evaluated pressure gradients. For a general solution and to take advantage of the correlations that are optimized for local conditions, these integrals must be evaluated numerically. Although it is especially suitable for use with the existing Data Items on two phase flow, this item allows other data on pressure losses in two phase flow to be employed. ESDU

N79-21295 California Univ., Davis.
DROPLET PHASE CHARACTERISTICS IN LIQUID-DOMINATED STEAM-WATER NOZZLE FLOW Ph.D. Thesis
Terry Willis Alger 1978 251 p
Avail: Univ. Microfilms Order No. 7905183

Droplet size distribution, spatial distribution and mean droplet velocity in low-quality, steam-water flow from a rectangular cross-section, converging-diverging nozzle were studied. A unique forward light scattering technique was developed for droplet size distribution measurements. Droplet spatial variations were investigated using light transmission measurements, and droplet velocities were measured with a laser-Doppler velocimeter system incorporating a confocal Fabry-Perot interferometer. Nozzle throat radius of curvature and height were varied to investigate their effects on droplet size. One-dimensional numerical calculations indicated that both the dynamic breakup (thermal equilibrium based on a critical Weber number of 6.0) and the boiling breakup (thermal nonequilibrium based on average droplet temperature) models predicted droplet diameters. Dissert. Abstr.

N79-21296 Cincinnati Univ., Ohio.
A STUDY OF THE VISCOUS FLOW IN TURBOMACHINES Ph.D. Thesis
Ihab Mohamed Khalil 1978 200 p
Avail: Univ. Microfilms Order No. 7904742

A method for analyzing the nonadiabatic viscous flow through turbomachine rotors is presented. The field analysis is based upon the numerical integration of the full incompressible Navier-Stokes equations, together with the energy equation, over the rotor blade-to-blade stream channels. The numerical code used to solve the governing equations, employs a nonorthogonal boundary-fitted coordinate system that suits the most complicated blade geometries. The effects of turbulence are modeled with a two-equation turbulence model, one expressing the development of the turbulent kinetic energy, and the other its dissipation rate. An Alternating-Direction-Implicit method is used to carry out the necessary numerical integration of the elliptic governing equations. The method of analysis is applied to various types of turbomachine rotors. Dissert. Abstr.

N79-21297 Wisconsin Univ. - Madison.
THE FLOW OF NON-DILUTE SUSPENSIONS OF GAS BUBBLES IN NON-NEWTONIAN FLUIDS Ph.D. Thesis
Robert Krafft Prudhomme 1978 248 p
Avail: Univ. Microfilms Order No. 7823083

The flow of non-dilute suspensions of gas bubbles in non-Newtonian fluids through horizontal tubes are investigated. The investigation centered on the dependence of the flow rate on the properties of the suspension at set values of the pressure drop. A new technique was developed for the generation of suspensions of small, spherical gas bubbles in slowly moving highly visco-elastic solutions of water soluble polymer. Bubbles are produced by electrolysis on a stainless steel grid through which polymer solution flows. Experiments were conducted with aqueous solutions of polyacrylamide at two levels of polymer concentration. Flow-rate data are presented in terms of the relative change in flow rate, defined as the difference between the flow rate of the suspension and the flow rate of the pure polymer solution (at the same pressure drop) all divided by the flow rate of the pure solution. In the treatment of the experimental data, two analyses are presented. Dissert. Abstr.

N79-21298 Pacific Univ., Stockton, Calif.
ISOVISCOSITY CURVES IN THE ANALYSIS OF THE PRESSURE-TEMPERATURE DEPENDENCE OF LIQUID VISCOSITY Ph.D. Thesis
Gayle Nathaniel King 1977 213 p
Avail: Univ. Microfilms Order No. 7907520

Viscosity was studied as a function of temperature and pressure. Instead of being directed toward a definitive equation of state derived from first principles, the major effort focussed on semi-empirical methods of approaching the problem. It was found that the Andrade equation doesn't adequately fit the data, that the Vogel Fulcher equation is inadequate at high viscosities, that the Gross equation and a double exponential equation can be improved, and that a new four parameter equation gave an excellent fit and merits further investigation. Dissert. Abstr.

N79-21299 Illinois Inst. of Tech., Chicago.
HYDRODYNAMIC ANALYSIS OF SOLIDS TRANSPORT Ph.D. Thesis
Hamid Arastoopour 1978 190 p
Avail: Univ. Microfilms Order No. 7903009

Slurry flow through a venturi and vertical pneumatic conveying of solids was studied by means of one-dimensional, steady-state, isothermal, unequal velocity models. Pressure drop in vertical transport of solids was calculated by using four hydrodynamic models. The calculations were done by using literature correlations of friction factors. The models predict a minimum in pressure drop versus superficial gas velocity. Pressure drop and flooding for countercurrent solids-gas flow were calculated by using several hydrodynamic models. Pressure drop and choking were also calculated for dense-phase vertical pneumatic conveying of solids using a model employing two continuity and two momentum equations. A three dimensional linearized mixing equation was

derived using separate phase continuity and three dimensional relative velocity equations. An attempt was also made to investigate possible solution using separation of variables technique. Dissert. Abstr.

N79-21300 Princeton Univ., N. J.
ATOMIZATION AND OTHER BREAKUP REGIMES OF A LIQUID JET Ph.D. Thesis
Rolf Deneys Reitz 1978 336 p
Avail: Univ. Microfilms Order No. 7907964

The identification of the mechanisms by which a liquid jet, injected through an orifice (nozzle) into a chamber of gas, breaks up into droplets is studied. Four main regimes of jet breakup are considered. Jet atomization was examined experimentally using two photograhic techniques. The tests were performed at room temperature using 14 individual nozzles including tube nozzles with length to diameter ratios from 85 to 0.5 with sharp and rounded inlets, each having the same exit diameter (0.34 mm). Five water and glycerol mixtures were tested and the injection pressure ranged from 500 psia (33 atm) to 2500 psia (166 atm). The chamber gases included air, nitrogen, helium and xenon with gas pressures on to 600 psia (40 atm). The following were measured from the photographs: The angle of divergence of the jet; the distance from the nozzle to the point of divergence; the jet diameter at the nozzle exit; and the jet tip velocity. Dissert. Abstr.

N79-21301 Iowa State Univ. of Science and Technology, Ames.
PREDICTION OF LAMINAR AND TURBULENT FLOW HEAT TRANSFER IN ANNULAR PASSAGES Ph.D. Thesis
Mujeeb Rehman Malik 1978 279 p
Avail: Univ. Microfilms Order No. 7907263

A numerical procedure for treating variable property laminar and turbulent convective heat transfer in straight annular passages is presented. The finite-difference scheme employed to solve the governing (parabolic) partial differential equations is a modification of the explicit Dufort-Frankel method which allows fairly large streamwise steps. The calculation scheme is evaluated for the following flow regimes: (1) laminar constant property flow; (2) laminar upward forced flow with buoyancy; and (3) turbulent flow with and without heat transfer. A major part of the study is devoted to the development and evaluation of turbulence models. A first-order ordinary differential equation for the transport of mixing length scale in the outer (center) part of the flow is proposed. The observed nonmonotonic development of centerline velocity and other flow parameters in a plane duct is well predicted by this model. Dissert. Abstr.

N79-21302 Iowa State Univ. of Science and Technology, Ames.
HEAT TRANSFER IN IN-TUBE FLOW OF NON-NEWTONIAN FLUIDS Ph.D. Thesis
Sadanand Dattatray Joshi 1978 302 p
Avail: Univ. Microfilms Order No. 7907255

Laminar flow heat transfer in flow of pseudoplastic fluids inside a tube subjected to a uniform wall heat flux boundary condition was analytically studied. The effects of non-Newtonian behavior and K-variation on heat transfer coefficients were evaluated. An analytical solution was obtained by employing the usual boundary layer assumptions. An explicit, stable, numerical scheme using the Dufort-Frankel finite-difference method was devised to solve the set of governing partial differential equations. Constant property solutions were obtained for various values of flow behavior index. In these solutions, increase in heat transfer above the Newtonian prediction was noticed. Heat transfer coefficients for two pseudoplastic solutions were experimentally determined. The Nusselt numbers were obtained for the entire thermal length in two different tubes. To these Nusselt numbers, the non-Newtonian correction, and the consistency correction, was applied. Dissert. Abstr.

N79-21303 Florida Univ., Gainesville.
ISOKINETIC SAMPLING OF AEROSOLS FROM TANGENTIAL FLOW STREAMS Ph.D. Thesis
Michael Dean Durham 1978 156 p
Avail: Univ. Microfilms Order No. 7907736

A comprehensive analysis of inertial effects in aerosol sampling was combined with a thorough study of swirling flow patterns in a stack following the exit of a cyclone in order to determine the errors involved in sampling particulate matter from a tangential flow stream. Two simultaneous samples, one isokinetic and the other anisokinetic, were taken from a 10 cm wind tunnel and compared to determine sampling bias as a function of Stokes number. Monodispersed uranine particles, generated with a spinning disc aerosol generator, and mechanically dispersed ragweed pollen were used as experimental aerosols. The duct velocity was varied from 550 to 3600 cm/sec and two nozzle diameters of 0.465 and 0.683 cm were used to obtain values of Stokes numbers from 0.007 to 2.97. Experiments were performed at four angles, 0, 30, 60 and 90 degrees, to determine the errors encountered. Dissert. Abstr.

N79-21304 Dayton Univ., Ohio.
PRESSURE DISTRIBUTION FROM MEASURED FILM THICKNESS AND TEMPERATURE DATA FOR ELASTO-HYDRODYNAMIC POINT CONTACT Ph.D. Thesis
Howard Edward Bandow 1978 185 p
Avail: Univ. Microfilms Order No. 7908502

Using the viscosity-temperature-pressure relationship for a lubricant, Reynolds' equation was solved in finite difference form to yield the pressure distribution from the simultaneously measured film thickness and temperature distribution. The elasticity relations for the bearing surfaces were formulated to yield the pressure distribution from the measured film thickness alone. The pressure distribution was obtained for representative contacts from measured data. A numerical technique was developed to determine the viscosity as a function of pressure and temperature in EHD rigs from measured film thickness and temperature data. The possibility of using EHD rigs as high pressure viscometers using the analysis developed appears to be feasible. Dissert. Abstr.

N79-21305 Dayton Univ., Ohio.
INVESTIGATIONS OF HEAT TRANSFER IN FIXED POROUS BEDS FOR APPLICATION TO THERMAL SWING SEPARATION PROCESSES Ph.D. Thesis
Edward Thomas Mahefkey, Jr. 1978 130 p
Avail: Univ. Microfilms Order No. 7908503

Theoretical considerations are described for several classical formulations of the problem of transient heat transfer in a flowing gas, porous solid media, namely the single-phase and two-phase models. The experimental aspects of this work centered on study of the transient heating and cooling response of the packed bed, and verification of the analytically predicted gas and solid phase temperature gradient equality in the flow regime of interest. The result obtained confirms the analytically predicted temporal and spacial equality of the gas and solid temperature profiles within the bed. These results were obtained by comparing the transient response of the bed wall temperature, approximately that of the solid near the walls, and the transient response of the gas temperature near the wall. Dissert. Abstr.

N79-21306 Illinois Univ. at Chicago Circle, Chicago.
CURVED TUBE HEAT TRANSFER IN LAMINAR, PULSATILE, FULLY-DEVELOPED FLOWS Ph.D. Thesis
Ming-Hsin Chang 1978 281 p
Avail: Univ. Microfilms Order No. 7908406

The effects of both fluid pulsations and curvature on fluid flow and heat transfer in a curved tube subject to pulsatile flow were investigated. A perturbation technique using the modified Dean number as the expansion parameter was applied to the simplified Navier-Stokes equations and energy equation in toroidal coordinate systems. The perturbed governing equations including the second order, are then solved systematically by either a direct integration or by employing the finite Hankel transform. The final results obtained through numerical integration and computation are presented graphically for fluid flow and heat transfer for a wide range of excitation parameters and Prandtl numbers. The effect of curvature is to induce a secondary flow due to the unbalanced fluid centrifugal force. This secondary flow increases the convective mixing between field particles thus enhancing the heat transfer. Dissert. Abstr.

N79-21307*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTS ON THE LARGE-SCALE STRUCTURE OF TURBULENCE IN THE NEAR-JET REGION

M. A. BadriNarayanan and Donald M. Kuehn Apr. 1979 30 p refs
(NASA-TM-78567; A-7756) Avail: NTIS HC A03/MF A01 CSCL 20D

The near region of an axisymmetric, turbulent jet was investigated. Turbulence quantities, as well as mean velocities, were measured between 3 and 23 diam away from the nozzle. The mean velocity profiles were similar over most of this distance, whereas the turbulence quantities were far from equilibrium conditions. Across the jet, the rate of large-scale turbulence varied considerably; however, a Strouhal number based on local velocity, the diameter of the jet, and the frequency of the large-scale turbulent oscillation remained relatively constant. The formation of the initial instability waves and the pairing of the vortices were examined. Turbulent fluctuations were observed only downstream of the pairing process. Author

N79-21308# Argonne National Lab., Ill. Reactor Analysis and Safety Div.
LIQUID-LIQUID CONTACT IN VAPOR EXPLOSION Ph.D. Thesis - Northwestern Univ.
Aryeh Segev Aug. 1978 188 p refs
(Contract W-31-109-ENG-38)
(ANL-78-92) Avail: NTIS HC A09/MF A01

Shock tube configurations which resulted in the production of vapor explosions were studied. The liquid-liquid contact of Freon-11, Freon-22, water, or ethanol with hot materials such as mineral oil, silicone oil, water, mercury, molten lead, or molten salt mixture produced various degrees of vapor explosions. Large pressures were obtained for systems of water-molten lead, butanol-molten lead, and water-salt. With the water-molten lead, three different regions were observed depending on whether the hot liquid was at, below, or above the nucleation temperature. When butanol was used as a cold liquid, four regions were observed. Experiments with molten salt and water at 410 C and 600 C resulted in low yield thermal interactions. It is concluded that the hydrodynamic effects may be significant in any shock tube analysis, especially when multiple interactions are observed. M.M.M.

N79-21309# Biphase Energy Systems, Inc., Santa Monica, Calif.
DEMONSTRATION OF A ROTARY SEPARATOR FOR TWO-PHASE BRINE AND STEAM FLOWS Final Report
Donald J. Cerini Jan. 1978 122 p refs
(Contract EY-76-C-03-1228)
(TID-28519) Avail: NTIS HC A06/MF A01

The application of a two-phase rotary separator for geothermal energy conversion was demonstrated. The system tested consisted of the major components of a total flow rotary separator/turbine conversion system. A nozzle converted the brine wellhead enthalpy to two-phase flow kinetic by impinging the nozzle flow tangentially on the inside of the separator. The flow was subjected to the high centrifugal force field in the separator. This caused the liquid phase to collect as a film on the separator drum with very little energy loss. The steam was allowed to flow radially inward to the central steam discharge. Potable water was obtained by condensing the steam exhaust. The brine collection system converted the liquid film kinetic energy to static pressure head. Application of the rotary separator/turbine to a two-stage flash steam system showed a calculated power increase of 18%. Author

N79-21310# Stanford Univ., Calif.
INSULATING WALL BOUNDARY LAYER IN A FARADAY MHD GENERATOR
Roy R. Rankin Apr. 1978 129 p refs
(Contract EX-76-C-01-2341)
(FE-23417) Avail: NTIS HC A07/MF A01

Experimental and analytical investigation was undertaken of the insulating wall boundary layer in a Faraday MHD generator. Insulating wall boundary layers show that modifications due to (MHD) effects have significant influence on the insulating wall friction and heat transfer in Faraday MHD generators. Modified flow (Hartmann Flow) is evidenced by an alteration of the velocity profile, due to the variation of the J x B force across the channel in the magnetic field direction. The nonuniform current distribution is related to variations in both the velocity and the electrical conductivity across the channel. The analytic model involved computerized solution, using finite difference techniques, of the momentum, energy, and electrical equations, including MHD effects for the turbulent insulating wall boundary layer. The turbulence model used, was the mixing length theory which was modified to include turbulence damping. Variable, equilibrium properties were employed producing a coupling between the momentum, energy, and electrical equations resulting in extended Hartmann flow. The experimental study consisted of the measurement of the velocity profile at the center of the insulating wall in an MHD generator using a laser anemometer. L.P.

N79-21311# Brown Univ., Providence, R. I. Div. of Applied Mathematics.
ON HEAD-ON COLLISION BETWEEN TWO SOLITARY-WAVES
C. H. Su and Rida M. Mirie Apr. 1979 31 p refs
(Contract N00014-76-C-0924; Grant NSF ENG-77-00982; NR Proj. 062-555)
Avail: NTIS HC A03/MF A01

Head-on collisions between two solitary waves on the surface of an inviscid, homogeneous fluid were studied. A perturbation method which can generate an asymptotic series of orders, is used to calculate the effects of the collision. Waves emerging from (i.e. long after) the collision preserve their original identities to the third order of accuracy. However, a collision does leave imprints on the colliding waves with phase shifts and shedding of secondary waves. The latter propagate with diminishing amplitudes in a direction opposite to that of the main waves. The maximum run-up amplitude of two colliding waves is also calculated. L.P.

N79-21312# Brown Univ., Providence, R. I. Div. of Applied Mathematics.
MOTION OF A VORTEX BLOTCH
C. H. Su Nov. 1978 7 p refs
(Contract N00014-76-C-0924; Grant NSF ENG-77-00982)
Avail: NTIS HC A02/MF A01

An equation is derived for invariant curves in the motion of a vortex blotch. Kirchhoff's elliptical vortex is shown to satisfy the equation exactly. It was also found that perturbations to a circular vortex are invariant configurations to the (third) order of approximation calculated. Author

N79-21313*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A HEAT EXCHANGER AND METHOD OF MAKING Patent Application
A. Fortini and John M. Kazaroff, inventors (to NASA) Filed 30 Nov. 1977 14 p
(NASA-Case-LEW-12441-2; US-Patent-Appl-SN-856462) Avail: NTIS HC A02/MF A01 CSCL 20D

A heat exchanger of increased effectiveness is described. A porous metal matrix is disposed in a metal chamber or between walls through which a heat-transfer fluid is directed. The porous metal matrix has internal bonds and is bonded to the chamber in order to remove all thermal contact resistance within the composite structure. A specific use is to provide a method of making a rocket chamber with maximum heat transfer at the throat area where inner wall temperatures are the highest. NASA

N79-21314# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
NONSTATIONARY OBLIQUE-SHOCK-WAVE REFLECTIONS IN NITROGEN AND ARGON: EXPERIMENTAL RESULTS
G. Ben-Dor Nov. 1978 79 p refs
(Grant AF-AFOSR-3033-77)
(UTIAS-237; CN-ISSN-0082-5255) Avail: NTIS HC A05/MF A01

Interferograms from a study on the reflection of non-stationary oblique shock-waves using a 23 cm dia field of view interferometer and a 10 cm x 18 cm hypervelocity shock tube are presented. The investigated incident shock-wave Mach number and compression corner angle ranges were 1 equal or less than Ms equal or less than 8 and 2 deg equal or less than theta sub w equal or less than 60 deg, respectively for both argon and nitrogen at an initial pressure approximately 15 torr and temperature approximately 300 K. The initial conditions as well as the accuracy

with which they were measured are given. A theoretical review underlying major findings of the study mentioned is also presented. Author

N79-21315# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
SURVEY OF FLOWS WITH NUCLEATION AND CONDENSATION
S. Kotake (Tokyo Univ.) and I. I. Glass Oct. 1978 92 p refs (Grant AF-AFOSR-3303-77)
(UTIAS-Review-42; CN-ISSN-0082-5247) Avail: NTIS HC A05/MF A01

The phenomenological (classical) theory of the quasi-steady droplet-formation model with appropriate correction factors can be made to fit homogeneous nucleation and condensation processes in cloud chamber, supersonic nozzle and shock tube flows. Statistical thermodynamics and numerical methods make it possible to understand small-cluster formation. Free-molecular techniques contributed significantly to the study of the kinetic processes of clusterization (especially dimerization) and to dynamic properties of small clusters. Heterogeneous nucleation is considered as an extension of the macroscopic theory of homogeneous nucleation. Considerable contributions to the kinetics of heterogeneous condensation are expected from flows in cloud chambers, supersonic nozzles and shock tubes for macroscopic features, as well as from free-molecular beam techniques for microscopic properties. A.R.H.

N79-21316*# Tuskegee Inst., Ala. School of Mechanical Engineering.
HEAT PIPE RADIATORS FOR SPACE Annual Report
John P. Sellers Sep. 1977 78 p refs
(Contract NAS9-13844)
(NASA-CR-160155; HP-3; AR-4) Avail: NTIS HC A05/MF A01 CSCL 20D

An optimized flight-weight prototype fluid-header panel (heatpipe radiator system) was tested in a vacuum environment over a wide range of coolant inlet temperatures, coolant flow rates, and environmental absorbed heat fluxes. The maximum performance of the system was determined. Results are compared with earlier data obtained on a smaller fluid-header feasibility panel, and computer predictions. Freeze-thaw tests are described and the change in thaw recovery time due to the addition of a low-freezing point feeder heat pipe is evaluated. Experimental panel fin-temperature distributions are compared with calculated results. A.R.H.

N79-21317# ARO, Inc., Arnold Air Force Station, Tenn.
A COMPUTER PROGRAM FOR THE AERODYNAMIC DESIGN OF AXISYMMETRIC AND PLANAR NOZZLES FOR SUPERSONIC AND HYPERSONIC WIND TUNNELS Final Report, Dec. 1975 - Oct. 1977
J. C. Sivells AEDC Dec. 1978 151 p refs
(AD-A062944; AEDC-TR-78-63) Avail: NTIS HC A08/MF A01 CSCL 20/4

A computer program is presented for the aerodynamic design of axisymmetric and planar nozzles for supersonic and hypersonic wind tunnels. The program is the culmination of the effort expended at various times over a number of years to develop a method of designing a wind tunnel with an inviscid contour which has continuous curvature and which is corrected for the growth of the boundary layer in a manner such that uniform parallel flow can be expected at the nozzle exit. The continuous curvature is achieved through specification of a centerline distribution of velocity (or Mach number) which has first and second derivatives that (1) are compatible with a transonic solution near the throat and with radial flow near the inflection point and (2) approach zero at the design Mach number. The boundary-layer growth is calculated by solving a momentum integral equation by numerical integration. Author (GRA)

N79-21318# ARO, Inc., Arnold Air Force Station, Tenn.
NUMERICAL ANALYSIS OF RECIRCULATING DUCTED FLOWS Final Report, 1 Oct. 1977 - 28 Feb. 1978
R. J. Schulz AEDC Dec. 1978 40 p refs
(AD-A062945; AEDC-TR-78-29) Avail: NTIS HC A03/MF A01 CSCL 20/4

A numerical solution procedure for ducted, recirculating flows was developed and applied to predict both turbulent pipe flow and ducted, coaxial jet mixing with recirculation. The solution procedure is based on a decay-function, finite-difference formulation applied to a system of governing equations based on stream functions and vorticity. The vorticity governing equation is complete in that no source terms have been deleted or neglected in its derivation from the Navier-Stokes equations. Boundary values for all dependent variables are defined by physically realistic conditions. Solutions obtained indicate that the accuracy of the solution procedure depends on having an accurate turbulent viscosity model. Author (GRA)

N79-21319# Brown Univ., Providence, R. I. R. I. Lefschetz Center for Dynamical Systems.
STABILITY OF MOTIONS OF THERMOELASTIC FLUIDS
C. M. Dafermos Nov. 1978 16 p refs
(Contract N00014-76-C-0278; Grants DAAG27-76-G-0294; NSF MCS-76-07247)
(AD-A063567) Avail: NTIS HC A02/MF A01 CSCL 20/3

It is shown that the second law of thermodynamics induces uniqueness and continuous dependence upon initial state and supply terms of smooth thermodynamic processes of thermoelastic fluids within the broader class of thermodynamic processes with shock waves. GRA

N79-21320# Ballistic Research Labs., Aberdeen Proving Ground, Md.
VENTING OF PRESSURE THROUGH PERFORATED PLATES Final Report
Charles Kingery, George Coulter, and Richard Pearson Sep. 1978 50 p refs
(AD-A063512; AD-E430145; ARBRL-TR-02105) Avail: NTIS HC A03/MF A01 CSCL 19/4

Results are presented for a series of experiments designed to determine the pressure venting characteristics of perforated plates. Pressure decay from a chamber as a function of the vented area is presented for a series of perforated plates. Author (GRA)

N79-21321# Nielsen Engineering and Research, Inc., Mountain View, Calif.
DIRECT TESTING OF SUBGRID-SCALE MODELS Annual Technical Report, 1 Nov. 1977 - 31 Oct. 1978
Oden J. McMillan and Joel H. Fertziger Nov. 1978 72 p refs
(Contract N00014-77-C-0008)
(AD-A063718; NEAR-TR-174) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report presents results from a continuing study in which the validity of models used in large-eddy simulations of turbulent flow is tested by comparison with results from exact simulations using the Navier-Stokes equations. The results to date are for models of the eddy-viscosity type applied to incompressible homogeneous flows. More complicated flows and models will be considered in future phases of this study. Author (GRA)

N79-21322# Southwest Research Inst., San Antonio, Tex.
BLAST OF SIMULTANEOUS MULTIPLE-CHARGE DETONATIONS
J. C. Hokanson, E. D. Esparza, A. B. Wenzel, and P. D. Price Oct. 1978 118 p refs
(Contract DAAA21-76-C-0254)
(AD-A063523; AD-E400232; ARLCD-CR-78032) Avail: NTIS HC A06/MF A01 CSCL 19/4

This report describes an experimental program conducted in support of the Army Plant Modernization Program. Air blast parameters including peak pressure and specific impulse were measured for multiple charges, detonated simultaneously, in three different geometrical configurations: grouped, horizontal and vertical arrays. A series of single charge tests was also conducted to establish a baseline from which the effects of multiple charges could be determined. A model analysis was developed and used to design and interpret the model experiments. In the experiments, pentolite spheres modeling potential explosive sources were detonated near a reflecting surface. Blast measurements were made directly below the charges and at various slant distances using piezoelectric transducers. The impulse was obtained by numerically integrating the pressure traces. Plots of

peak pressure, impulse, duration and arrival time are presented and the differences between single and multiple charges are highlighted. GRA

N79-21323# Air Force Academy, Colo. Frank J. Seiler Research Lab.
WATER TUNNEL MEASUREMENTS OF UNSTEADY SEPARATION Interim Report, Oct. 1977 - Oct. 1978
Michael S. Francis, James D. Lang, and John E. Keesee Dec. 1978 53 p refs
(AD-A063330; FJSRL-TR-78-0011) Avail: NTIS HC A04/MF A01 CSCL 20/4

The results of experiments in which a controlled region of flow separation was generated downstream of an oscillating fence-type spoiler located on one surface of an airfoil are discussed. The experiments were conducted in a low speed water tunnel under incompressible flow conditions over wide range dimensionless frequencies and Reynolds numbers. High speed motion pictures and still photographs of hydrogen bubbles formed at surface mounted electrodes were used to obtain data regarding the shape and growth characteristics of the separation zone. Under certain conditions an energetic vortex-like structure was observed to form behind the spoiler and evolve in a manner determined by the Reynolds number and dimensionless frequency parameters. Observations of flow development reveal that the global structure of the separated region during the formation process is qualitatively similar to the one encountered in classical dynamic stall. Author (GRA)

N79-21324# Massachusetts Inst. of Tech., Cambridge. Acoustics and Vibration Lab.
LOW WAVENUMBER LEVELS OF TURBULENT BOUNDARY LAYER WALL PRESSURE FLUCTUATIONS IN ZERO AND ADVERSE GRADIENTS Final Report, Mar. 1976 - Sep. 1977
M. Moeller, P. Leehey, and N. C. Martin Sep. 1978 89 p refs
(Contract N00014-75-C-0509)
(AD-A063710; A/V-82464-2) Avail: NTIS HC A05/MF A01 CSCL 20/4

The low wavenumber components of the turbulent boundary layer wavenumber frequency spectrum of wall pressure fluctuations were measured with two flush-mounted rectangular plates having approximately clamped boundary conditions. The plates were designed to provide low wavenumber measurements at higher frequencies and wavenumbers than previous plate experiments in order to provide data comparable with measurements made by Farabee and Geib (7) with an array of flush-mounted microphones. The low wavenumber measurements were made in the M.I.T. low noise low turbulence subsonic wind tunnel under zero and adverse pressure gradient conditions. When nondimensionalized on outer boundary layer variables the adverse pressure gradient data do not exhibit increased levels from those of the zero pressure gradient data. The zero pressure gradient data are in good agreement with the levels reported by Farabeen and Geib (7) for the same nondimensional frequency and wavenumber range. Author (GRA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N79-21325 Wayne State Univ., Detroit, Mich.
THE ORIGIN AND DEVELOPMENT OF THE CARRIER FREQUENCY AND ACHROMATIC CONCEPTS IN HOLOGRAPHY Ph.D. Thesis
Emmett N. Leith 1978 131 p
Avail: Univ. Microfilms Order No. 7908935

The concepts used in radar as applied to optical holography are discussed. Two aspects of the research are the introduction of the carrier frequency method into holography, and the ideas for achromatizing the process of holography, allowing holography to be carried out with radiation of greater band-width, with lesser coherence. The carrier frequency and the achromatic concepts as extended into optical holography are discussed. One aspect of the achromatic concept is the elimination of lateral chromatic dispersion in carrier frequency holography, permitting carrier frequency holography to be carried out with temporal coherence requirements no greater than for Gabor's in-line holography; and another is the elimination of longitudinal chromatic dispersion, which allows either in-line or carrier frequency holography to be carried out with spatially coherent white light. Dissert. Abstr.

N79-21326 State Univ. of New York at Stony Brook.
HOLOGRAPHIC RECONSTRUCTION OF 3-D SECTIONS OF CRYSTALS Ph.D. Thesis
Sheldon Allen Cantor 1978 122 p
Avail: Univ. Microfilms Order No. 7907570

Development of hybrid opto-digital approach to imaging, with application to X-ray crystollography is considered. The Stroke-Halioua Fourier-domain projection theorem is presented which leads to the imaging of three-dimensional sections of a crystal's electron density functions. This is accomplished through successive use of digital and optical (holographic) computing and display steps. This hybrid scheme makes use of holographic optical computing techniques with computer-generated holograms. Three methods are detailed for producing the required holograms and experimental results are presented for actual crystals. The information content and signal to noise ratio is evaluated for the best of the three methods and its results discussed in comparison with currently practiced methods of display in crystallography. Suggestions for future work are included. Dissert. Abstr.

N79-21327*# Lockheed Electronics Co., Houston, Tex.
ACOUSTIC SENSOR ENGINEERING EVALUATION TEST REPORT
E. L. Phillips, Jr. and R. D. Bronson Jun. 1976 76 p
(Contract NAS9-12200)
(NASA-CR-160151; LEC-8472; JSC-11159) Avail: NTIS HC A05/MF A01 CSCL 14B

Two types of one-inch diameter sound pressure level sensors, which are candidates for monitoring ambient noise in the shuttle orbiter crew compartment during rest periods, were exposed to temperature, passive humidity, and vibration. One unexposed sensor of each type served as a reference unit. Except for the humidity exposures, each of the three capacitive microphones was individually tested in sequence with the essential voltage power supply and preamplifier. One unit exibited anomalous characteristics after the humidity exposure but returned to normal after being dried in an oven at 115 deg for two hours. Except for the humidity exposures, each of the three piezoelectric microphones was individually tested with a laboratory type amplifier. Two apparent failures occurred during these tests. The diaphragm on one was found ruptured after the fourth cycle of the humidity test. A second sensor showed an anomaly after the random vibration tests at which time its sensitivity was consistent at about one-half its former value. A.R.H.

N79-21328*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
PRELIMINARY DESIGN AND DEVELOPMENT OF A REFLECTANCE SPECTROMETER INSTRUMENT Final Report
Thomas B. McCord 19 Jan. 1979 16 p
(Contract NASw-3008)
(NASA-CR-158467) Avail: NTIS HC A02/MF A01 CSCL 14B

An improved design for the reflectance spectrometer is described to be used on various terrestrial body missions. These improvements were made on the original Lunar Polar Orbiter design. These include a larger entrance mirror, rectangular aperture, multiple optical beams, spatial resolution, and a bandwidth extension to 5 microns. In addition, detailed electronic designs were produced for a charge amplifier and an amplifier/demodulator/integrator. Design of a microprocessor driven test

system was begun. Laboratory tests were performed on a tuning fork chopper. J.A.M.

N79-21329*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMULATED ELECTRONIC HETERODYNE RECORDING AND PROCESSING OF PULSED-LASER HOLOGRAMS
Arthur J. Decker Apr. 1979 40 p refs
(NASA-TP-1444; E-9813) Avail: NTIS HC A03/MF A01 CSCL 14E

The electronic recording of pulsed-laser holograms is proposed. The polarization sensitivity of each resolution element of the detector is controlled independently to add an arbitrary phase to the image waves. This method which can be used to simulate heterodyne recording and to process three-dimensional optical images, is based on a similar method for heterodyne recording and processing of continuous-wave holograms. A.R.H.

N79-21330# Kaman Sciences Corp., Colorado Springs, Colo.
A SOLID STATE DIGITAL DATA RECORDER FOR MONITORING AUTOMOTIVE CRASH ENVIRONMENTS Final Report, Jan. 1977 - Jul. 1978
Randolph J. Wolf Feb. 1978 73 p
(Contract DOT-HS-6-01472)
(PB-289039/0; K-78-24U(R); DOT-HS-803666) Avail: NTIS HC A04/MF A01 CSCL 14C

A solid state digital data recorder was developed for use in monitoring automotive impact environments. The recorder was designed to be a general purpose, on board data acquisition system. Each recorder channel has its own sensor preamplifier, analog to digital converter, 4096 x 8 bit random access memory, and digital to analog converter. The functions of reading and storing data by the recorder channels are determined by a single, common control module. A nine channel system was evaluated via a pneumatic shock machine, vibration testing on a shaker, 30 mph sled simulated vehicle-barrier impacts, and 30 mph vehicle barrier impacts. GRA

N79-21331# Army Missile Research and Development Command, Redstone Arsenal, Ala. Technology Lab.
SPECTRAL DENSITY ANALYSIS OF GYRO VIBRATIONS
L. J. Little 19 Jun. 1978 98 p refs
(AD-A063554; DRDMI-T-78-59) Avail: NTIS HC A05/MF A01 CSCL 17/7

In Newtonian gyros, the bearings were identified as a first order source of error. Over the years, a significant amount of research was devoted to improving the quality of different type contact bearings. In conjunction with task of improving the bearings, a similar effort has involved identifying the bearing effects on gyro performance. The thrust in this report involves two similar types of measurements of gyro vibrations to enable detecting faulty bearings or establishing a signature of gyro performance. A gyro wheel from a precise instrument application was selected for this study because of the very high quality performance required in the parent system. Author (GRA)

N79-21332# Hawaii Univ., Honolulu.
AUTOMATIC ANGULATION STUDY Final Report, 1 Mar. 1976 - 28 Feb. 1978
John T. Jeffries 23 Aug. 1978 15 p
(Contract F19628-76-C-0144; AF Proj. 6110)
(AD-A063255; AFGL-TR-78-0149) Avail: NTIS HC A02/MF A01 CSCL 14/2

This report describes a prototype instrument designed and constructed to demonstrate the feasibility of automatically measuring horizontal angles in the field. Instrumental problems discovered in testing are described. Author (GRA)

36 LASERS AND MASERS

Includes parametric amplifiers.

N79-21333* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GAS ION LASER CONSTRUCTION FOR ELECTRICALLY ISOLATING THE PRESSURE GAUGE THEREOF Patent
Charles E. Wood (TRW, Inc., Redondo Beach, Calif.) and Robert S. Witte, inventors (to NASA) (TRW Inc., Redondo Beach, Calif.) Issued 6 May 1975 5 p Filed 10 Sep. 1973 Sponsored by NASA
(NASA-Case-MFS-22517-1; US-Patent-3,882,417; US-Patent-Appl-SN-395895; US-Patent-Class-331-94.5T; US-Patent-Class-315-108; US-Patent-Class-331-94.5G) Avail: US Patent and Trademark Office CSCL 20E

A gas ion laser with a pressure gauge and a gas pressure reservoir connected to the laser through a valve is described. The valve and the pressure gauge are electrically insulated from the laser discharge path by connecting them in series with the cathode of the laser. The laser cathode can be grounded and preferably is a cold cathode although a hot cathode may be used. The cold cathode is provided with a central aperture to which is connected both the pressure gauge and the gas pressure reservoir through the valve. This effectively prevents electric discharges from passing either to the pressure gauge or the valve which would otherwise destroy the pressure gauge.
Official Gazette of the U.S. Patent and Trademark Office

N79-21334*# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
LASER POWER CONVERSION SYSTEM ANALYSIS, VOLUME 1 Final Report, 26 Sep. 1977 - 26 Sep. 1978
W. S. Jones, L. L. Morgan, J. B. Forsyth, and J. P. Skratt 15 Mar. 1979 109 p refs
(Contract NAS3-21137)
(NASA-CR-159523-Vol-1; LMSC-D673466-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 20E

The orbit-to-orbit laser energy conversion system analysis established a mission model of satellites with various orbital parameters and average electrical power requirements ranging from 1 to 300 kW. The system analysis evaluated various conversion techniques, power system deployment parameters, power system electrical supplies and other critical supplies and other critical subsystems relative to various combinations of the mission model. The analysis show that the laser power system would not be competitive with current satellite power systems from weight, cost and development risk standpoints. Author

N79-21335*# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
LASER POWER CONVERSION SYSTEM ANALYSIS, VOLUME 2 Final Report, 26 Sep. 1977 - 26 Sep. 1978
W. S. Jones, L. L. Morgan, J. B. Forsyth, and J. P. Skratt 15 Mar. 1979 112 p refs
(Contract NAS3-21137)
(NASA-CR-159523-Vol-2; LMSC-D673466-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 20E

The orbit-to-ground laser power conversion system analysis investigated the feasibility and cost effectiveness of converting solar energy into laser energy in space, and transmitting the laser energy to earth for conversion to electrical energy. The analysis included space laser systems with electrical outputs on the ground ranging from 100 to 10,000 MW. The space laser power system was shown to be feasible and a viable alternate to the microwave solar power satellite. The narrow laser beam provides many options and alternatives not attainable with a microwave beam. Author

N79-21336*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PULSE SWITCHING FOR HIGH ENERGY LASERS Patent Application
James B. Laudenslager (JPL) and Thomas J. Pacala, inventors (to NASA) (JPL) 23 Mar. 1979 23 p
(Contract NAS7-100)
(NASA-Case-NPO-14556-1; US-Patent-Appl-SN-023485) Avail: NTIS HC A02/MF A01 CSCL 20E

A pulse forming network for compressing the width and sharpening the rise time of high voltage pulses from relatively slow rise time generators is discussed. The network also provides impedance matching from a high impedance source to a low impedance load for the purpose of efficient energy transfer. Cascaded saturable inductor switches are provided for pulse width compression so that output pulses having rise times of less than one hundred nanoseconds can be obtained. The pulse rise

times were determined by the thickness of a high permeability material forming the saturable inductor switch. A means for magnetically biasing the saturable inductor switch so that only pulses from a pulse generator having one polarity are passed and pulses having the opposite polarity are blocked is presented. NASA

N79-21337*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Research Lab.
LASER ROCKET SYSTEM ANALYSIS Final Report, 27 Sep. 1976 - 27 Sep. 1978
W. S. Jones, J. B. Forsyth, and J. P. Skratt 15 Mar. 1979 198 p refs
(Contract NAS3-20372)
(NASA-CR-159521; LMSC-D564671A) Avail: NTIS HC A09/MF A01 CSCL 20E

The laser rocket systems investigated in this study were for orbital transportation using space-based, ground-based and airborne laser transmitters. The propulsion unit of these systems utilizes a continuous wave (CW) laser beam focused into a thrust chamber which initiates a plasma in the hydrogen propellant, thus heating the propellant and providing thrust through a suitably designed nozzle and expansion skirt. The specific impulse is limited only by the ability to adequately cool the thruster and the amount of laser energy entering the engine. The results of the study showed that, with advanced technology, laser rocket systems with either a space- or ground-based laser transmitter could reduce the national budget allocated to space transportation by 10 to 345 billion dollars over a 10-year life cycle when compared to advanced chemical propulsion systems (LO2-LH2) of equal capability. The variation in savings depends upon the projected mission model. L.S.

N79-21338# University of South Florida, Tampa. Dept. of Chemistry.
PHOSPHORUS CHEMILUMINESCENCE FEASIBILITY STUDIES FOR AN ULTRAVIOLET AND VISIBLE CHEMICAL LASER Final Report, 1 Aug. 1977 - 31 Jul. 1978
Ahsan U. Khan and Brian Stevens Jul. 1978 14 p
(Grant AF-AFOSR-3376-77; AF Proj. 2303)
(AD-A062765; AFOSR-78-1633TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

The aim of this project was to explore whether an inverted population of electronically excited species either, (1) exists among the intermediates of the phosphorus chemiluminescence reaction or, (2) can be generated by excitation of atomic and molecular species added to the flame. In an investigation of laser light amplification on traversing phosphorus chemiluminescent flames using light in the 280-500 nm region, under certain conditions there is suggestion of amplification but because of the scattering at the interfaces no definite conclusion can be drawn. In the chemi-excitation experiments the two emission lines at 5787 and 5806 A which were tentatively assigned as excited state - excited state transitions of K are good candidates for lasing. The other emissions, the 5765 3A emission tentatively assigned to NaK and the Na and K doublets have lasing potential depending on the mechanism of excitation. The phosphorus flame and the atomic and molecular composition of the NaK stream are extremely susceptible to pressure and temperature changes and, as in the light amplification studies, the obvious next step is to confine the system in a heat pipe oven where these variables can be strictly controlled. Author (GRA)

N79-21339# Avco-Everett Research Lab., Mass.
INVESTIGATION OF OPTIMUM LASER PUMPING Interim Report, 16 Nov. 1977 - 15 May 1978
B. N. Srivastava, J. H. Jacob, and M. Rokni Dec. 1978 35 p refs
(Contract N00014-75-C-0062; DARPA Order 3500)
(AD-A062921) Avail: NTIS HC A03/MF A01 CSCL 20/5

An important task of the Optimum Pumping Technology program is the investigation of the feasibility of discharge pumping electronic transition lasers. Such an investigation requires a detailed knowledge of the secondary electron transport properties that may be obtained from a numerical solution of the Boltzmann code. An example of an electronic transition discharge pumped laser is hgCl*. GRA

N79-21340# JAYCOR, Alexandria, Va.
DEVELOP AND PERFORM EXPERIMENTS FOR HIGH ENERGY DENSITY IMPLOSION SYSTEMS Final Report
R. Burton 20 Sep. 1978 21 p
(Contract N00173-78-C-0420)
(AD-A062779; J78-6077-FR) Avail: NTIS HC A02/MF A01 CSCL 20/9

Work completed under this contract covers two facets of the development of high energy density plasma implosion systems. In the area of laser-guided discharges the following tasks were accomplished: a preliminary analysis of the laser-aerosol-air interactions, which are responsible for initiating laser breakdown, was performed; and a detailed air chemistry code, CHMAIR, was developed to follow the evolution of air plasmas created by CO2 lasers and other heating or ionization sources to determine their temprature and chemical composition. Simple hydrodynamic calculations were performed to predict channel radial growth. In the area of LINUS implosion systems the following tasks, in addition, were performed: engineering designs have been provided for the HELIUS and LINUS-O machines; and experiments have been performed using the NRL 'water model' to measure the effect of duct shape and operating parameters on cylindrical and quasi-spherical implosions. GRA

N79-21341# Naval Research Lab., Washington, D. C.
PHAROS 2 ALIGNMENT SYSTEM Interim Report
John M. McMahon Aug. 1978 19 p refs
(AD-A063372; AD-E000243; NRL-MR-3830) Avail: NTIS HC A02/MF A01 CSCL 20/5

This memo report is a documentation of the manual alignment system on the Pharos II Nd Glass Laser System and describes the operation of this system in a step-by-step fashion. Further improvements are possible and planned (including a fully automated system), hence, this is an interim report which reflects the status as of Mid-1977 rather than a final report. The alignment system achieves beam pointing to accuracies better than 40 microradians and beam centering on components to less than 2% of the diameter. Temporal synchronization to 5 ps is also achieved. Author (GRA)

N79-21342# Naval Research Lab., Washington, D. C. Magnetism Branch.
BEAM OPTICS OF THE QUADRUPOLE MAGNET STATE SELECTOR Interim Report
Mark Rubenstein 15 Nov. 1978 12 p refs
(AD-A063375; NRL-8274) Avail: NTIS HC A02/MF A01 CSCL 20/5

The hydrogen beam optics of the quadrupole magnet state selector designed by RCA for ultimate use in a satellite-borne hydrogen maser was theoretically analyzed. With the aid of several simplifying assumptions, the polarization of the hydrogen atoms entering the storage bulb was calculated as a function of the length of the quadrupole state selector. Author (GRA)

N79-21343# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXTENDED KALMAN FILTER FOR USE IN A SHARED APERTURE MEDIUM RANGE TRACKER M.S. Thesis
Daniel E. Mercier Dec. 1978 160 p refs
(AD-A064191; AFIT/GA/EE/78D-3) Avail: NTIS HC A08/MF A01 CSCL 17/5

An extended Kalman filter algorithm, using outputs from a forward looking infrared (FLIR) sensor as measurements, is used to track a point source target in an open loop tracking problem. The filter estimates the translational position changes of the target in the FLIR field of view due to two effects: actual target motion, and apparent motion caused by atmospheric turbulence. Sixteen cases are examined to determine the performance of the filter as a function of signal-to-noise ratio, Gaussian beam, size, the ratio of RMS target motion to RMS atmospheric jetter, target correlation times, and mismatches between the true shape and the shape assumed by the filter. The performance of the extended Kalman filter is compared to the performance of an existing correlation tracker under identical initial conditions. A one sigma tracking error of .2 and .8 picture elements is obtained with signal-to-noise ratios of 20 and 1 respectively. No degradation in performance is observed when the beam size is decreased or when the target correlation time

is increased over a limited range, when filter parameters are adjusted to reflect this knowledge. Sensitivity analysis shows that the filter is robust to minor changes in target intensity size.
Author (GRA)

N79-21470*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACEBORNE RANGING SYSTEM
David E. Smith *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 59-64 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N79-21344 Wisconsin Univ. - Madison.
ON THE DYNAMIC SIMULATION OF LARGE NONLINEAR MECHANICAL SYSTEMS Ph.D. Thesis
Raymond Joseph Cipra 1978 120 p
Avail: Univ. Microfilms Order No. 7823054

An analytical technique is presented for determining the dynamic response of large complex nonlinear systems. The simulation technique is aimed at large problems for which a portion is nonlinear and which are responding to inputs in such a manner that a linear model is not adequate. The types of problems addressed are those which require enormous amounts of numerical data for their model description, or for which it may be very difficult to analytically derive the controlling equations of motion. The technique takes advantage of substructuring and frequency domain concepts to isolate nonlinearities and drastically reduce problem size. A method of time integration for nonlinear differential equations is presented based upon the repetitive analytical (modal) solution of a set of equations linearized about the current operating position. This linearized set of equations may include viscous damping. The method incorporates a variable time step suited to the degree of nonlinearity and as shown in an example problem, gives comparable agreement in results with a Runge-Kutta numerical technique.
Dissert. Abstr.

N79-21345* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
WATER SEPARATOR Patent
Winfred F. Dunn (Garrett Corp., Los Angeles) and Irving G. Austin, inventors (to NASA) (Garrett Corp., Los Angeles) Issued 28 Apr. 1964 4 p Filed 23 Dec. 1960 Sponsored by NASA (NASA-Case-XMS-01295-1; US-Patent-3,131,040; US-Patent-Appl-SN-77869; US-Patent-Class-55-159) Avail: US Patent and Trademark Office CSCL 13I

An apparatus for separating liquids from gases or gaseous fluids is described. Features of the apparatus include: (1) the collection and removal of the moisture in the fluid is not dependent upon, or affected by gravity; (2) all the collected water is cyclically drained from the apparatus irrespective of the attitude of the separator; and (3) a fluid actuator is utilized to remove the collected water from the separator.
J.M.S.

N79-21346 Florida Univ., Gainesville.
THE FUNDAMENTAL DEVELOPMENT OF DESIGN PROCEDURE FOR A FULL SPECTRUM OF LINKAGE DWELL MECHANISM Ph.D. Thesis
Mostafa Taat 1978 477 p
Avail: Univ. Microfilms Order No. 7907800

A new normalized form of design chart for Geneva mechanisms, along with the design equations and a complete characteristic design table are given. Cases eliminating jerk and acceleration at the beginning and end of motion between dwells by combing different Geneva mechanisms in series are investigated, and characteristics of Genevas driven by inverted-slider cranks and symmetrical coupler four-bar mechanisms having special coupler curves are also treated. With these tools the designer can control the amplitude and frequency of input torque variations up to the third derivative, which is the slope of the acceleration characteristic and is directly related to both factors which dominate dynamic behavior, namely the first and third derivatives of the motion transmission ratio, and it is believed that these represent the key to the dynamic design of dwell mechanisms.
Dissert. Abstr.

N79-21347 Wayne State Univ., Detroit, Mich.
MATHEMATICAL MODELING OF COMBUSTION PROCESS IN A SPARK-IGNITION ENGINE Ph.D. Thesis
Kosol Surakomol 1978 172 p
Avail: Univ. Microfilms Order No. 7908968

One-dimensional unsteady analysis of turbulent flame propagation was used to determine the heat release rate. This model considers the combustion chamber geometry, piston face profile and spark plug location. The chemical kinetic analysis was used to predict the NO emission level as a function of time and chamber position. Equilibrium calculation of CO emission level at the end of combustion process was performed. A computer program was developed to solve the flame propagation and kinetic equations. A parametric study was performed to investigate the effects of spark plug location on combustion duration, flame velocity and emission levels of NO and CO.
Dissert. Abstr.

N79-21348 Oklahoma Univ., Norman.
WHIRLING RESPONSE AND STABILITY OF FLEXIBLY MOUNTED, RING-TYPE FLYWHEEL SYSTEMS Ph.D. Thesis
Liang-Chu Timothy Chen 1978 121 p
Avail: Univ. Microfilms Order No. 7908816

The scarcity and rising cost of petroleum have motivated international interest in developing hybrid automobiles using flywheels for mechanical energy storage. Rim-type composite-material flywheels are promising designs for such development. Free whirling, stability, and forced whirling are examined for these flywheel systems. The numerical results presented are most directly applicable to the Sandia single-rim systems currently under development. However, the present analyses can be extended to other flywheel designs within the broad category of the rim type.
Dissert. Abstr.

N79-21349 Engineering Sciences Data Unit, London (England).
EQUILIBRIUM TEMPERATURES IN SELF-CONTAINED BEARING ASSEMBLIES. PART 4: HEAT TRANSFER COEFFICIENT AND JOINT CONDUCTANCE
1978 14 p
(ESDU-78029; ISBN-0-85679-233-0) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC E99

Data is provided on heat transfer coefficients and joint conductances appropriate to external surfaces of self-contained bearing assemblies, required for estimating temperatures in the assembly. Typical applications include all types of machinery from domestic appliances to spacecraft mechanisms.
ESDU

N79-21350 Engineering Sciences Data Unit, London (England).
EQUILIBRIUM TEMPERATURES IN SELF-CONTAINED BEARING ASSEMBLIES. PART 1: OUTLINE OF METHOD OF ESTIMATION
1978 9 p
(ESDU-78026; ISBN-0-85679-230-6) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC E99

A method of estimating the equilibrium (steady-state) temperature in a self-contained bearing assembly was described. The system is an assembly from which no heat is dissipated to the exterior by lubricant or liquid coolant flow, i.e. the heat is dissipated by convection and radiation from the external surfaces of the assembly. Measured bearing temperature can vary widely between apparently identical assemblies, due to differences in the environment, differences in thermal conductances to joints in the assembly, and differences in friction coefficients between individual bearings.
ESDU

N79-21351*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WELD BEAD REINFORCEMENT REMOVAL: A METHOD OF IMPROVING THE STRENGTH AND DUCTILITY OF PEAKED WELDS IN 2219-T87 ALUMINUM ALLOY PLATE

Charles V. Lovoy Jan. 1979 36 p refs
(NASA-TM-78221) Avail: NTIS HC A03/MF A01 CSCL 20K

The results of a study to determine the degree to which the ductility and tensile properties of peaked welds could be enhanced by removing the reinforcing bead and fairing the weld nugget into the adjacent parent metal are presented. The study employed 2219-T87 aluminum alloy plate, tungsten inert gas (TIG) welding, and 2319 filler wire. The study concluded that significant improvements in peak weld, ultimate strength, and ductility can be obtained through removal and fairing of the weld reinforcing bead. The specimens so treated and tested in this program exhibited ultimate strength improvements of 2 to 3 percent for peak angles of 5.8 to 10 degrees and 10 to 22 percent for welds with peak angles of 11.7 to 16.9 degrees. It was also determined that removal of the weld bead enhanced the ability of peaked welds to straighten when exposed to cyclic loading at stress levels above the yield strength. G.Y.

N79-21352*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE 12TH AEROSPACE MECHANISMS SYMPOSIUM
Apr. 1979 241 p refs Symp. held at Moffett Field, Calif., 27-28 Apr. 1978; sponsored in part by NASA, Calif. Inst. of Tech. and Lockheed
(NASA-CP-2080; A-7737) Avail: NTIS HC A11/MF A01 CSCL 20K

Mechanisms developed for various aerospace applications are discussed. Specific topics covered include: boom release mechanisms, separation on space shuttle orbiter/Boeing 747 aircraft, payload handling, spaceborne platform support, and deployment of spaceborne antennas and telescopes. For individual titles, see N79-21353 through N79-21373.

N79-21353*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DEVELOPMENT OF A BEDREST MUSCLE STRESS APPARATUS
Cletis R. Booher, Sonne L. Hooper (Nelson and Johnson Eng., Inc.), and Drel N. Setzer (Nelson and Johnson Eng., Inc.) *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 3-12 refs (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

In attempting further to define the deleterious effects of spaceflight on the human body, measurement systems and techniques were devised to determine the loss of skeletal muscle strength and tone as a result of spaceflight exposure. In order to determine how the muscle degradation process progresses with time during nonuse, a system for measuring muscle stress during bedrest was developed. The Bedrest Muscle Stress Apparatus is configured to slip snugly over the foot board of a standard hospital bed. Data collected with this device correlated well with pre- and post-bedrest data collected with the original skeletal muscle stress apparatus. Author

N79-21354*# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
ULTRA HIGH RESOLUTION STEPPER MOTORS DESIGN, DEVELOPMENT, PERFORMANCE AND APPLICATION
H. Moll and G. Roeckl *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 13-23 refs (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The design and development of stepper motors with steps in the 10 arc sec to 2 arc min range is described. Some of the problem areas, e.g. rotor suspension, tribology aspects and environmental conditions are covered. A summary of achieved test results and the employment in different mechanisms already developed and tested is presented to give some examples of the possible use of this interesting device. Adaptations to military and commercial requirements are proposed and show the wide range of possible applications. J.M.S.

N79-21355*# Marconi Space and Defence Systems Ltd., Frimley (England).
THE DESIGN AND DEVELOPMENT OF A SELF-COMMUTATING STEPPER MOTOR
K. R. Dalley *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 25-34 refs (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The system discussed adopts a well established and space proven motor, the 'stepper-motor' and shows that with simple commutation techniques it can be operated as a brushless dc motor at high speeds. J.M.S.

N79-21356*# Fairchild Space and Electronics Co., Germantown, Md.
A DEPLOYABLE .015 INCH DIAMETER WIRE ANTENNA
Lamont DiBiasi *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 35-42 (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

This mechanism was developed to dispense a small diameter wire which serves as a receiving antenna for electric field measurements on an Earth orbiting satellite. The antenna is deployed radially from a spinning satellite. A brushless dc motor drives a storage spool to dispense the wire at a controlled rate. Centrifugal force, acting on a mass attached to the end of the wire, keeps the wire in the radial position. The mechanism design, testing, and performance characteristics are discussed. Finally, operational data of the mechanism while in orbit are presented. J.M.S.

N79-21357*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MARS PENETRATOR UMBILICAL
Christopher E. Barns *In its* The 12th Aerospace Mech. Symp. Apr. 1979 p 43-49 (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The device proposed to gather subsurface data on the planet Mars is a ballistic probe which penetrates the soil after a free fall through the Martian atmosphere. Highlights of the design, development, and testing of several features of the Mars Surface Penetration Probe are outlined. J.M.S.

N79-21358*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE VOYAGER MAGNETOMETER BOOM
David C. Miller *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 51-62 refs (For primary document see N79-21352 12-37)
(Contract NAS7-100)
Avail: NTIS HC A11/MF A01 CSCL 20K

The Voyager spacecraft magnetometer experiment utilizes two sensors on a deployable boom. The boom is an Astromast. The implementation of the Astromast into the Voyager design is described along with the hardware used to hold, latch, and deploy the mast and the tests to demonstrate damping, deployment, and alignments. Several problems encountered are discussed and their solutions are given. Flight deployment and preliminary alignment results are presented. Finally, the design is evaluated in retrospect. J.M.S.

N79-21359*# American Science and Engineering, Inc., Cambridge, Mass.
FOCAL PLANE TRANSPORT ASSEMBLY FOR THE HEAO-B X-RAY TELESCOPE
R. Brissette, P. D. Allard, F. Keller, E. Strizhak, and E. Wester *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 63-76 refs (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The High Energy Astronomy Observatory - Mission B (HEAO-B), an earth orbiting X-ray telescope facility capable of locating and imaging celestial X-ray sources within one second of arc in the celestial sphere, is considered. The Focal Plane Transport Assembly (FPTA) is one of the basic structural elements of the three thousand pound HEAO-B experiment payload. The FPTA is a multifunctional assembly which supports seven imaging X-ray detectors circumferentially about a central shaft and accurately positions any particular one into the focus of a high resolution mirror assembly. A drive system, position sensor, rotary coupler, and detent alignment system, all an integral part of the rotatable portion which in turn is supported by main bearings to the stationary focal plane housing are described. J.M.S.

N79-21360*# Astro Research Corp., Santa Barbara, Calif.
AN 11-METER DEPLOYABLE TRUSS FOR THE SEASAT RADAR ANTENNA
Bruce E. Campbell and Wesley Hawkins (Ball Bros. Res. Corp., Boulder, Colo.) *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 77-88 Prepared for JPL (For primary document see N79-21352 12-37)
(Contract NAS7-100)
Avail: NTIS HC A11/MF A01 CSCL 20K

A folding three dimensional truss and tripod assembly which deploys the SEASAT Synthetic Aperture Radar Antenna is described. The folding structure with the antenna panels and rf components stows in an 8.5-inch-thick package. Upon deployment, the structure produced is a flat and rigid support for the antenna. J.M.S.

N79-21361*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HATCH LATCH MECHANISM FOR SPACELAB SCIENTIFIC AIRLOCK
G. R. terHaar (Ver. Flugtech. Werke-Fokker G.m.b.H., Netherlands) *In its* The 12th Aerospace Mech. Symp. Apr. 1979 p 89-99 ref (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The requirements, design tradeoff, design, and performance of the Spacelab scientific airlock hatch latching mechanisms are described. At space side the hatch is closed and held against internal airlock/module pressure by 12 tangential overcenter hooks driven by a driver. At module side the hatch is held by 4 hooks driven by rollers running on a cammed driver. J.M.S.

N79-21362*# Entwicklungsring Nord, Bremen (West Germany). Raumfahrtechnik G.m.b.H.
DESIGN FEATURES OF SELECTED MECHANISMS DEVELOPED FOR USE IN SPACELAB
W. Inden *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 101-117 refs (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

Selected mechanisms developed for the Spacelab program are discussed. These include: (1) the roller rail used to install/remove the Spacelab floor loaded with racks carrying experiments; (2) the foot restraint; and (3) the lithium hydroxide used for decontamination. J.M.S.

N79-21363*# British Aircraft Corp., London (England).
THE DESIGN AND TESTING OF A MEMORY METAL ACTUATED BOOM RELEASE MECHANISM
D. G. Powley and G. B. Brook (Fulmer Res. Inst. Ltd.) *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 119-129 ref (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A boom latch and release mechanism was designed, manufactured and tested, based on a specification for the ISEE-B satellite mechanism. From experimental results obtained, it is possible to calculate the energy available and the operating torques which can be achieved from a torsional shape memory element in terms of the reversible strain induced by prior working. Some guidelines to be followed when designing mechanisms actuated by shape memory elements are included. J.M.S.

N79-21364*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ADVANCED VEHICLE SEPARATION APPARATUS
Michael J. OSpring and Ronald E. Mancini *In its* The 12th Aerospace Mech. Symp. Apr. 1979 p 131-141 (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A method of obtaining test data from two independent models or bodies in a conventional wind tunnel is described. The system makes efficient use of wind tunnel test time with computer control performing complex coordinate transformations necessary for model positioning. The apparatus is designed to be used in any of the three Unitary Wind Tunnels at NASA-Ames Research Center. Mechanical design details and a brief description of the control system for the separation apparatus are presented. J.M.S.

N79-21365*# Hughes Aircraft Co., Culver City, Calif.
DEPLOYMENT MECHANISMS ON PIONEER VENUS PROBES
W. L. Townsend, R. H. Miyakawa, and F. R. Meadows *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 143-155 (For primary document see N79-21352 12-37)
(Contract NAS2-8300)
Avail: NTIS HC A11/MF A01 CSCL 20K

Deployment mechanisms were developed to position scientific instruments during probe descent into the Venus atmosphere. Each mechanism includes a provision for pyrotechnic release of the enclosure door, negator springs for positive deployment torque, and an active damper using a shunted dc motor. The deployment time requirement is under 2 seconds, and the deployment shock must be less than 100 g's. The mechanism is completely dry lubricated and constructed mainly of titanium for high strength and high temperature stability. The mechanism was qualified for descent decelerations up to 565 g's and for instrument alignment up to 940 F. The mechanism requirements, the hardware design details, the analytical simulations, and the qualification testing are described. J.M.S.

N79-21366*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE SEPARATION MECHANISMS
William F. Rogers *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 157-170 ref (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The development of space shuttle separation devices is reviewed to illustrate the mechanisms involved in separating the orbiter from the Boeing 747 carrier aircraft and from the externally mounted propellant tank. Other aspects of the separation device development discussed include design evolution, operational experience during the orbiter approach and landing tests, and the work to be accomplished before an operational system becomes a reality. J.M.S.

N79-21367*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE SHUTTLE ORBITER SEPARATION BOLTS
Robert S. Ritchie (TransTechnology Corp.) *In its* The 12th Aerospace Mech. Symp. Apr. 1979 p 171-179 (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

Evolution of the space shuttle from previous spacecraft systems dictated growth and innovative design of previously standard ordnance devices. Initially, one bolt design was programmed for both 747 and external tank application. However, during development and subsequent analyses, two distinct designs evolved. The unique requirements of both bolts include: high combined loading, redundant initiation, flush separation plane, self-righting and shank attenuation. Of particular interest are the test methods, problem areas, and use of subscale models which demonstrated feasibility at an early phase in the program. The techniques incorporated in the shuttle orbiter bolts are applicable to other mechanisms. Author

N79-21368*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PNEUMATIC PRELOADED SCANNING SCIENCE LAUNCH LATCH SYSTEM
J. C. Kievit *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 181-190 (For primary document see N79-21352 12-37)
(Contract NAS7-100)
Avail: NTIS HC A11/MF A01 CSCL 20K

A relatively simple system using a preloaded pneumatic piston latch with a pyrotechnic valve release was developed. The system was the only candidate that met all the imposed requirements utilizing reliable state-of-art components. The development of the latch system from its first use on Mariner '69 Mars Flyby Spacecraft through its most recent use on the Voyager Spacecraft that will fly to Jupiter and Saturn is reviewed. J.M.S.

N79-21369*# FMC Corp., Chicago, Ill.
SPACE SHUTTLE PAYLOAD HANDLING ON THE LAUNCH PAD
Andrew Rado *In* NASA. Ames. Res. Center The 12th Aerospace

Mech. Symp. Apr. 1979 p 191-200 (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A payload change-out room developed to provide a controlled environment and the structural platform for a payload ground handling mechanism (PGHM), which performs the actual installation or removal of the payload is described. Design efforts to develop a PGHM compatible with the free-standing launch vehicle and the payload change-out room housing are discussed. Requirements of the PGHM considered include compensation for structural deflections resulting from wind forces and the transfer of the payload weight and protection for the payload, the orbiter, and the PGHM itself against damaging impacts that could occur during such deflections. J.M.S.

N79-21370*# Sperry Flight Systems, Phoenix, Ariz.
DEPLOYMENT/RETRACTION MECHANISM FOR SOLAR MAXIMUM MISSION HIGH GAIN ANTENNA SYSTEM
Neal Bennett and Peter Preiswerk (Astro Res. Corp., Santa Barbara, Calif.) *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 201-210 (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A mechanism called a deployment/retraction assembly (DRA) which provides not only a stable, but a deployable platform for the high gain antenna system (HGAS) aboard the Solar Maximum Mission (SMM) spacecraft is described. The DRA also has the capability to retract the system upon command. J.M.S.

N79-21371*# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
GEOS AXIAL BOOMS
Gunter K. Schmidt *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 211-221 refs (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A booms and mechanisms subsystem was designed, developed, and qualified for the geostationary scientific satellite GEOS. Part of this subaystem consist of four axial booms consisting of one pair of 1 m booms and one pair of 2.5 m booms. Each of these booms is carrying one bird cage electric field sensor. Alignment accuracy requirements led to a telescopic type solution. Deployment is performed by pressurized nitrogen. At deployment in orbit two of these booms showed some anomalies and one of these two deployed only about 80%. Following this malfunction a detailed failure investigation was performed resulting in a design modification of some critical components as release mechanism, guide sleeves of the telescopic elements, and pressure system. J.M.S.

N79-21372*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DEPLOYABLE ANTENNA REFLECTOR
William B. Palmer *In* NASA. Ames Res. Center The 12th Aerospace Mech. Symp. Apr. 1979 p 223-232 (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The first phase in the development of a solid surface, deployable, antenna reflector is outlined and discussed. The deployment concept is described in conjunction with illustrations and photos of the fabricated reflector models. Details and results of the thermal distortion analysis are presented. Results indicate that the discussed reflector concept is an effective approach in satisfying the requirements for large deployable antennas in the 6 GHz to 100 GHz frequency regime. Author

N79-21373*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA-ARC 91.5-cm AIRBORNE INFRARED TELESCOPE
Robert E. Mobley and Ted M. Brown *In its* The 12th Aerospace Mech. Symp. Apr. 1979 p 233-242 refs (For primary document see N79-21352 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A 91.5 cm aperture telescope installed aboard NASA-Lockheed C-141A aircraft for the performance of infrared astronomy is described. A unique feature of the telescope is that its entire structure is supported by a 41 cm spherical air bearing which effectively uncouples it from aircraft angular motion, and with inertial stabilization and star tracking, limits tracking errors to less than 1 arc second in most applications. A general description of the system, a summary of its performance, and a detailed description of an offset tracking mechanism is presented. J.M.S.

N79-21374*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 11TH AEROSPACE MECHANISMS SYMPOSIUM
28 Apr. 1977 243 p refs Symp. held at Greenbelt, Md., 28-29 Apr. 1977; Sponsored by NASA, LMSC, and Calif. Inst. of Technol.
(NASA-CP-2038) Avail: NTIS HC A11/MF A01 CSCL 20K

Various mechanisms in aerospace engineering were presented at this conference. Specifications, design, and use of spacecraft and missile components are discussed, such as tail assemblies, radiometers, magnetormeters, pins, reaction wheels, ball bearings, actuators, mirrors, nutation dampers, airfoils, solar arrays, etc. For individual titles, see N79-21375 through N79-21395.

N79-21375*# PRC Systems Services Co., Kennedy Space Center, Fla.
DESIGN AND DEVELOPMENT OF THE SPACE SHUTTLE TAIL SERVICE MASTS
S. R. Dandage, N. A. Herman, S. E. Godfrey, and R. T. Uda *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 1-12 refs (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The successful launch of a space shuttle vehicle depends on the proper operation of two tail service masts (TSMs). Reliable TSM operation is assured through a comprehensive design, development, and testing program. The results of the concept verification test (CVT) and the resulting impact on prototype TSM design are presented. The design criteria are outlined, and the proposed prototype TSM tests are described. J.A.M.

N79-21376*# Societe Matra (France).
SCANNING AND FOCUSING MECHANISMS OF METEOSAT RADIOMETER
J. Jouan *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 13-22 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

Two mechanisms, both of screw-jack type are described. The scanning mechanism, an oil lubricated and sealed unit drives and accurately positions the telescope of the METEOSAT radiometer. The dry lubricated focusing mechanism is used to adjust the focus of this telescope. The METEOSAT program is nearly completed, and the first flight model will be launched at the end of the year. J.A.M.

N79-21377*# Hughes Aircraft Co., El Segundo, Calif.
MAGNETOMETER DEPLOYMENT MECHANISM FOR PIONEER VENUS
William L. Townsend *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 23-33 (For primary document see N79-21374 12-37)
(Contract NAS2-8300)
Avail: NTIS HC A11/MF A01 CSCL 20K

A three segment, 15-foot boom mechanism was developed to deploy magnetometers from the Pioneer Venus orbiter spinning shelf. The stowage mechanism is designed to contain the magnetometers during launch and to deploy these instruments by centrifugal force upon pyrotechnic release. Unique graphite-epoxy boom segments are used for a lightweight design with sufficient strength to withstand a 7.5 g orbit insertion force while extended. The detailed design is described, along with the test methods developed for qualification in a one-g field. Author

N79-21378*# Martin Marietta Corp., Denver, Colo.
FLY-AWAY RESTRAINT PIN MECHANISM FOR THE ARMY'S PATRIOT MISSILE SYSTEM
Frederick W. Knight *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 35-44 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The development of the longitudinal restraint mechanism for

the Army's Patriot missile system is reviewed. The initial design was an ordnance pin puller with a shear plane. Because of reliability problems and a desire to reduce cost, a fly-away restraint mechanism was chosen. After being manually unlocked, the restraint pin disengages the missile during launch by missile motion. Author

N79-21379*# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).

MAGNETIC BEARING MOMENTUM WHEELS WITH MAGNETIC GIMBALLING CAPABILITY FOR 3-AXIS ACTIVE ATTITUDE CONTROL AND ENERGY STORAGE

Rainer S. Sindlinger *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 45-55 refs (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

Magnetic bearings used for the suspension of momentum wheels provide conclusive advantages: the low friction torques and the absence of abrasion allow the realization of lightweight high speed wheels with high angular momentum and energy storage capacity and virtually unlimited lifetime. The use of actively controlled bearings provides a magnetic gimballing capability by applying the external signals to the two servo loops controlling the rotational degrees of freedom. Thus, an attitude control system can be realized by using only one rotating mass for 3-axis active satellite stabilization. Author

N79-21380*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

AN APPLICATION OF INTERACTIVE COMPUTER GRAPHICS TECHNOLOGY TO THE DESIGN OF DISPERSAL MECHANISMS

B. J. Richter and B. H. Welch *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 57-66 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

Interactive computer graphics technology is combined with a general purpose mechanisms computer code to study the operational behavior of three guided bomb dispersal mechanism designs. These studies illustrate the use of computer graphics techniques to discover operational anomalies, to assess the effectiveness of design improvements, to reduce the time and cost of the modeling effort, and to provide the mechanism designer with a visual understanding of the physical operation of such systems. Author

N79-21381*# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).

CARTRIDGE FIRING DEVICE DESIGNED FOR ATTACHMENT, RELEASE AND EJECTION OF A SATELLITE

Lucien Pierron *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 67-76 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The device functions were performed by a one-piece unit with resulting performances which were of interest regarding the satellite attachment and the accuracies of the path and velocity during separation and ejection. A gain in weight may be obtained relative to the conventional device used, i.e. maintenance belt, belt unlocking device, pusher spring, and cartridge fired pusher. J.A.M.

N79-21382*# PRC Systems Services Co., Kennedy Space Center, Fla.

THE MJS-77 MAGNETOMETER ACTUATOR

William C. Stange *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 77-86 ref (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A two-position (0 deg and 180 deg) actuating mechanism (flipper) driven by alternately-heated wax motors (pellets) will be used to rotate the low field triaxial fluxgate magnetometer experiment on the 1977 Mariner Jupiter-Saturn spacecraft to its 0 deg and 180 deg positions. The magnetic field, power requirements, weight and volume of this device are very restrictive. The problems encountered in design and development of this mechanism are presented. Author

N79-21383*# TRW Defense and Space Systems Group, Redondo Beach, Calif.

POSITIVE COMMANDABLE OILER FOR SATELLITE BEARING LUBRICATION

Gordon E. James *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 87-95 refs (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The results of a feasibility study showed that on-orbit commandable lubrication of ball bearings can be accomplished by direct oil application to the moving ball surfaces. Test results for the lubricant applicator portion of the system are presented, in conjunction with a design approach for the reservoir and metering components. Author

N79-21384*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

TRIDENT 1 THIRD STAGE MOTOR SEPARATION SYSTEM

B. H. Welch, B. J. Richter, and P. Sue *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 97-105 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The third stage engine separation system has shown through test and analysis that it can effectively and reliably perform its function. The weight of the hardware associated with this system is well within the targeted value. J.A.M.

N79-21385*# Martin Marietta Corp., Denver, Colo.

DOCKING AND RETRIEVAL MECHANISM

J. Robert Tewell and Richard A. Spencer *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 107-116 refs (For primary document see N79-21374 12-37)
(Contract NAS8-31290)
Avail: NTIS HC A11/MF A01 CSCL 20K

An engineering prototype docking and retrieval mechanism (DRM) is described which enables two spacecraft to dock and be structurally joined on-orbit. The joining of two spacecraft or payloads on-orbit supports future planned space activities such as payload servicing, deployment and retrieval, and assembly of large space systems. The DRM, as developed, provides advantages over prior approaches because it is a nonimpact docking mechanism, does not require impact absorbing mechanisms or attitude stabilization on the target spacecraft, is capable of docking to a spinning spacecraft, and can spin up and deploy a spinning spacecraft or payload. J.A.M.

N79-21386*# Hughes Aircraft Co., El Segundo, Calif.

TORQUE-WHILE-TURNAROUND SCAN MIRROR ASSEMBLY

Charles John Starkus *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 117-126 refs (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

Mechanical aspects in the development of an oscillating scan mirror mechanism were reviewed, that featured a remarkably low level of structural vibration for the impact energies involved in mirror oscillation. Another feature was that energy lost during impact was returned to the mirror by applying torque only during the instant of impact. Because the duration of impact was only about 0.010 second, it was critical that energy losses be minimal because there was not much time to restore them. J.A.M.

N79-21387*# Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland).

WEAR-RESISTANT BALL BEARINGS FOR SPACE APPLICATIONS

H. Boving, H. E. Hintermann, W. Haenni, E. Bondivenne (ESA, Frascati, Italy), M. Boeto (CNES, Toulouse, France), and M. Conde (CNES, Toulouse, France) *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 127-137 refs (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

Ball bearings for hostile environments were developed. They consist of normal ball bearing steel parts of which the rings are coated with hard, wear-resistant, chemical vapor deposited (C.V.D) TiC. Experiments in ultrahigh vacuum, using cages of

various materials with self-lubricating properties, have shown that such bearings are suitable for space applications. J.A.M.

N79-21388*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ACTIVE NUTATION DAMPER FOR SPACECRAFT
Richard A. Abercrombie and Thomas W. Flatley *In its* The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 139-152 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

An active nutation damping device, consisting of an angular accelerometer, a dc-motor-driven flywheel, and associated electronics, was developed for spacecraft use. This damping system was used on the LAGEOS spacecraft, launched May 4, 1976, to control nutation buildup during the long coast period (approximately 75 minutes) after the third stage separation. Of the many electrical and mechanical design choices involved, the use of an angular rather than linear accelerometer offers some advantages. There are some problems of adapting the angular accelerometer to spacecraft use. The damper package was evaluated and proven on a three-axis gas-bearing simulator that duplicated the LAGEOS spacecraft critical flight dynamics. A failure analysis of the damper assembly was performed. J.A.M.

N79-21389*# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
GEOS-20 m CABLE BOOM MECHANISM
Buenter K. Schmidt and Klaus Suttner *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 153-162 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The GEOS cable boom mechanism allows the controlled deployment of a 20 m long cable in a centrifugal force field. In launch configuration the flat cable is reeled on a 240 mm diameter drum. The electrical connection between the rotating drum and the stationary housing is accomplished via a flexlead positioned inside the drum. Active motion control of this drum is achieved by a self locking worm gear, driven by a stepper motor. The deployment length of the cable is monitored by an optical length indicator, sensing black bars engraved on the cable surface.
Author

N79-21390*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A LOW COST HIGH TEMPERATURE SUN TRACKING SOLAR ENERGY COLLECTOR
Gerald S. Perkins *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 163-175 (For primary document see N79-21374 12-37)
(Contract NAS7-100)
Avail: NTIS HC A11/MF A01 CSCL 20K

The design and economic evaluation of a low cost high temperature two-axis, sun tracking solar energy collector is described. The collector design was specifically intended for solar energy use with the freedom of motion about its two control axes limited only to the amplitude required to track the sun. An examination of the performance criteria required in order to track the sun and perform the desired solar energy conversion was used as the starting point and guide to the design. This factor, along with its general configuration and structural aspect ratios, was the significant contributor to achieving low cost. The unique mechanical design allowed the control system to counter wide tolerances specified for the fabrication of the azimuth frame and to perform within a small tracking error. J.A.M.

N79-21391*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TWO-DIMENSIONAL OSCILLATING AIRFOIL TEST APPARATUS
Frank L. Gibson, Andrew J. Hocker, Jr., and Dennis S. Matsuhiro *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 177-184 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A two dimensional oscillating airfoil test apparatus is presented as a method of measuring unsteady aerodynamic forces on an airfoil or rotor blade section. The oscillating airfoil test rig, which is being built for use in an 11 X 11-foot transonic wind tunnel (speed range M = 0.4 - 1.4), will allow determination of unsteady loadings and detailed pressure distributions on representative airfoil sections undergoing simulated pitching and flapping motions. The design details of the motion generating system and supporting structure are presented. This apparatus is now in the construction phase. J.A.M.

N79-21392*# Aerospatiale Etablissement des Mureaux (France).
DEVELOPMENT OF A SATELLITE FLYWHEEL FAMILY OPERATING ON ONE ACTIVE AXIS MAGNETIC BEARINGS
Pierre C. Poubeau *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 185-201 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

Since the samarium-cobalt magnets were available at industrial level, new possibilities appeared in the area of magnetic bearings with the radial passive centering and axial control of the rotor position. Magnetic bearings of this type on which a wide effort was made towards the optimization for satellite flywheel applications are described. Also, the momentum and reaction wheels were considered. This work was extended to the kinetic storage of energy for satellites. J.A.M.

N79-21393*# Martin Marietta Corp., Orlando, Fla.
THE CONCEPTION, BIRTH, AND GROWTH OF A MISSILE UMBILICAL SYSTEM
Glenn W. Nordman *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 203-212 ref (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The design development was traced for the sprint 2 and improved sprint 2 missile system (ISMS) umbilical system. The unique system requirements, umbilical designs considered to meet the requirements, and the problems encountered and solutions derived during the design, and development testing of the selected systems are described. The sprint 2 development effort consisted of design, analysis, and testing activities. The ISMS effort involved the performance of an extensive trade study to determine the optimum design to meet the ISMS conditions. J.A.M.

N79-21394*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FOCUS DRIVE MECHANISM FOR THE IUE SCIENTIFIC INSTRUMENT
Edward J. Devine and Thomas B. Dennis, Jr. *In its* The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 213-221 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

A compact, lightweight mechanism was developed for in-orbit adjustment of the position of the secondary mirror (focusing) of the International Ultraviolet Explored telescope. This device is a linear drive with small (.0004 in.) and highly repeatable step increments. Extremely close tolerances are also held in tilt and decentering. The unique mechanization is described with attention to the design details that contribute to positional accuracy. Lubrication, materials, thermal considerations, sealing, detenting against launch loads, and other features peculiar to flight hardware are discussed. The methods employed for mounting the low expansion quartz mirror with minimum distortion are also given. Author

N79-21395*# Hawker Siddeley Dynamics Ltd., Stevenage (England). Space Div.
DESIGN AND DEVELOPMENT OF A SOLAR ARRAY DRIVE
Terence Rees and John M. Standing *In* NASA. Goddard Space Flight Center The 11th Aerospace Mech. Symp. 28 Apr. 1977 p 223-240 (For primary document see N79-21374 12-37)
Avail: NTIS HC A11/MF A01 CSCL 20K

The design and development of a dry lubricated direct solar array pointing mechanism is discussed from its inception in 1970 to its present development into a flight mechanism for use on the Orbital Test Satellite (OTS), MAROTS, European Communication satellite and others. Results of life testing the original prototype and the OTS mechanism are presented together with an appraisal of expected future development. Author

N79-21396# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
RECENT PROGRESS IN PUMP RESEARCH, VOLUME 1
Dec. 1973 278 p refs Lecture held at Rhode-Saint-Genese, Belgium, 10-14 Dec. 1973 2 Vol.
(VKI-Lecture-Series-61-Vol-1) Avail: NTIS HC A13/MF A01

Various research projects are described for centrifugal and induced pumps. Cavitation and three dimensional flow were studied in relation to pumps, impellers, and blades. For individual titles, see N79-21397 through N79-21400.

N79-21397# Escher Wyss Ltd., Zurich (Switzerland).
CAVITATION
H. Grein *In* Von Karman Inst. for Fluid Dyn. Recent Progr. in Pump Res., Vol. 1 Dec. 1973 91 p refs (For primary document see N79-21396 12-37)
Avail: NTIS HC A13/MF A01

Cavitation is characterized by the formation of vapor pockets in the interior or mostly on the boundary walls of a fluid stream. In opposition to the phenomenon of cooking which may be produced by heat convection or by lowering the ambient pressure in a liquid, the phenomenon of cavitation is distinguished by a local vaporization of a liquid due to hydrodynamic pressure reduction. This zone of vaporization is either steady or unsteady and normally it disturbs the regular flow. J.A.M.

N79-21398# Ateliers de Constructions Electriques de Charleroi (Belgium).
APPLICATION OF QUASI THREE-DIMENSIONAL CALCULATION METHODS TO INDUSTRIAL PUMPS
P. Hance *In* Von Karman Inst. for Fluid Dyn. Recent Progr. in Pump Res., Vol. 1 Dec. 1973 25 p (For primary document see N79-21396 12-37)
Avail: NTIS HC A13/MF A01

The object was to show that it was possible to use the described computer program to aid the design of impellers, both centrifugal and mixed flow type. Experiences and theoretical flow field were connected in order to calibrate the black-box, quasi three dimensional analysis. This calibration was done before using the program for designing new pumps. For the centrifugal impellers, effect was directed to the matching impeller-volute and impeller-inlet; for the mixed flow impeller, the one dimensional design was eliminated. J.A.M.

N79-21399# Worthington Pump International, Inc., Desio (Italy).
INDUCER PUMPS
A. Janigro and F. Ferrini *In* Von Karman Inst. for Fluid Dyn. Recent Progr. in Pumps Res., Vol. 1 Dec. 1973 110 p refs (For primary document see N79-21396 12-37)
Avail: NTIS HC A13/MF A01

Inlet geometry optimization is examined. One dimensional method for inducer design is described, including geometrical requirements, inducer-impeller matching, correlations, and inducer designs. Some aspects of noncavitating flow in an inducer operating at off-design conditions were considered, along with design flow rate and off-design flow rate. J.A.M.

N79-21400# Ateliers de Constructions Electriques de Charleroi (Belgium).
QUASI THREE-DIMENSIONAL ANALYSIS AND DESIGN PROCESS FOR CENTRIFUGAL PUMP IMPELLERS
P. Kirsch *In* Von Karman Inst. for Fluid Dyn. Recent Progr. in Pump Res., Vol. 1 Dec. 1973 51 p refs (For primary document see N79-21396 12-37)
Avail: NTIS HC A13/MF A01

A theoretical process based on fully three-dimensional theories was developed. The theoretical developments leading to a quasi-three-dimensional calculation method are described. The method was considered as well as some indications concerning the blade to blade plane calculations using the singularity method. J.A.M.

N79-21401# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
RECENT PROGRESS IN PUMP RESEARCH, VOLUME 2
Dec. 1973 334 p refs Lecture held at Rhode-Saint-Genese, Belgium, 10-14 Dec. 1973 2 Vol.
(VKI-Lecture-Series-61-Vol-2) Avail: NTIS HC A15/MF A01

The nature of the slip factor in centrifugal pumps is examined as well as cooling laws for hot-film anemometers used in measuring turbulent water flow. The dynamic characteristics of hydraulic turbomachines are discussed with emphasis on the effect of scale on performance and efficiency. The influence of the radius of the volute on the length of a vaneless diffuser is studied. For individual titles, see N79-21402 through N79-21405.

N79-21402# Ateliers de Constructions Electriques de Charleroi (Belgium).
THEORETICAL AND REAL SLIP FACTOR IN CENTRIFUGAL PUMPS
A. Noorbakhsh *In* Von Karman Inst. for Fluid Dyn. Recent Progr. in Pump Res., Vol. 2 Dec. 1973 135 p refs (For primary document see N79-21401 12-37)
Avail: NTIS HC A15/MF A01

The theoretical slip factor depends on the unavoidable slip of the turbulent flow in the impeller channels. Two theoretical slip factors FGT : a two dimensional one (FGT2) and a three dimensional one (FGT3) are distinguished according to the type of calculation process used to determine the factor. By systematically varying the main geometrical parameters of the impeller, a general table for FGT2 is established which can be very useful for the pumps designer. An experimental study, covering five different impellers and involving the development of special instrumentation, provided the local and global values of FGR. This latter is strongly influenced by the working conditions. A correlation between the real and the theoretical slip factors was derived for any working conditions. This allows a more accurate prediction of performance at off-design conditions. A.R.H.

N79-21403# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
HOT FILM MEASUREMENTS PRINCIPLES AND SYSTEMS
D. Olivari and Aldo Salaspini *In its* Recent Progr. in Pump Res., Vol. 2 Dec. 1973 38 p refs (For primary document see N79-21401 12-37)
Avail: NTIS HC A15/MF A01

The relation between the velocity of a fluid and the heat transfer from the hot sensor to the fluid is the operational basis for a hot film anemometer which contains a thin film of platinum deposited on an inert material leading to a much stronger probe with similar electrical characteristics. The possibilities and problems associated with the use of the hot-film anemometer in turbulent water flows are discussed. Topics cover; (1) cooling law for electrically heated thin film; (2) variable fluid temperature effects; (3) drift; (4) flow angle determination; (5) real time signal processing in sampling procedures; (6) hot film response in unsteady flows; and (7) using hot film for measuring wall stresses. A.R.H.

N79-21404# Technische Universitaet, Darmstadt (West Germany).
SCALE EFFECT ON PERFORMANCE AND EFFICIENCY OF HYDRAULIC TURBOMACHINES
J. Osterwalder *In* Von Karman Inst. for Fluid Dyn. Recent Progr. in Pump Res., Vol. 2 Dec. 1973 51 p (For primary document see N79-21401 12-37)
Avail: NTIS HC A15/MF A01

The change of characteristic lines of geometrically similar turbomachines by variation in Reynolds number is discussed. Topics covered include general considerations on scale effect; the basis of different scale effect equations; and conditions to be fulfilled for research and measuring techniques. The research progarm of the Dramstadt Circle is reviewed as well as guidelines presented to carry out scale effect tests and the evaluation of test results. A.R.H.

N79-21405# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
FLOWS IN SCROLL
Aldo Salaspini *In its* Recent Progr. in Pump Res., Vol. 2 Dec. 1973 109 p refs (For primary document see N79-21401 12-37)
Avail: NTIS HC A15/MF A01

Several traverses were made at the wheel exit and inside the scroll of an industrial pump to check the influence of the

scroll tongue on the machine's characteristics. A tongue far from the wheels yields higher heads at small flow rates; the nominal point changes with different tongues. The wheel exit flow is not influenced by the tongue and the nominal point of operation of the wheel does not change. At optimum conditions, the scroll can be separated into a diffuser region and a collector region. On this basis, a semi-empirical two-dimensional theory is proposed to calculate either the flow conditions or the scroll geometry.
A.R.H.

N79-21406# Southwest Research Inst., San Antonio, Tex. Dept. of Engine and Vehicle Research.
SINGLE-CYLINDER DIESEL ENGINE TESTS WITH UNSTABILIZED WATER-IN-FUEL EMULSIONS Final Report, Jan. 1977 - Jun. 1977
J. O. Storment and C. W. Coon Aug. 1978 89 p refs
(Contract DOT-TSC-920)
(AD-A062751; USCG-D-13-78; TSC-USCG-77-4) Avail: NTIS HC A05/MF A01 CSCL 21/4

A single-cylinder, four-stroke cycle diesel engine was operated on unstabilized water-in-fuel emulsions. Two prototype devices were used to produce the emulsions on-line with the engine. More than 350 test points were run with baseline diesel fuel and emulsified water-in-fuel. Water content of the emulsified fuel varied from about 2% to 23% by volume. Statistically significant decreases in fuel consumption, ranging from 1.2% to 5.1% were obtained with emulsified fuels in 20 out of 36 test conditions. An increase of 2.5% was measured at one condition only. Use of the emulsified fuels decreased oxides of nitrogen by up to about 60% and Bosch smoke numbers by up to almost 70%, whereas unburned hydrocarbons increased up to over 130%. Carbon monoxide changes with emulsified fuel varied from a decrease of 52% to an increase of over 170%, depending on engine speed and power, and water content of the fuel. No problems were encountered in engine operation at any test condition with the water-in-fuel emulsions. Author (GRA)

N79-21407# Army Construction Engineering Research Lab., Champaign, Ill.
DETERMINATION OF THE EFFECT OF CURRENT AND TRAVEL SPEED OF SHIELDED METAL-ARC WELDING ON THE MECHANICAL PROPERTIES OF A36, A516, AND A514 STEELS Interim Report
R. A. Weber Nov. 1978 54 p refs
(AD-A063213; CERL-IR-M-248) Avail: NTIS HC A04/MF A01 CSCL 11/6

This study was performed to determine the limits on current and travel speed -- in particular, nugget area -- as defined by the results of tensile and impact properties of butt joint welds produced by manual shielded metal-arc welding in carbon steel (A36), pressure-vessel steel (A516), and high-strength, low-alloy steel (A514). Author (GRA)

N79-21408# Oregon State Univ., Corvallis. Transportation Research Inst.
THE ENERGY AND ENVIRONMENTAL CONSEQUENCES OF INCREASED VEHICLE SIZE AND WEIGHT, VOLUME 1 Final Report, Jul. 1976 - Jan. 1978
R. D. Layton, R. G. Hicks, J. G. Mingle, R. E. Phelps, and W. C. Cantwell Jan. 1978 173 p refs
(Contract DOT-OS-60142)
(PB-290335/9; DOT-RSPA-DPB-50-78-26-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 13F

Different aspects of large size and weight vehicles were studied. Findings include (1) nonuniformity in size and weight regulations between states which creates artificial barriers to economic truck operation, (2) increasing axle loads by 33 percent could reduce pavement surface life by 80 percent unless thickness is increased by 2 1/2 inches, (3) the effect of larger, heavier trucks on the traffic stream can be quantified using a computer program developed in the study, (4) the data base for safety effects is inadequate, (5) operating costs are less for heavier, larger trucks, (6) environmental effects appear to be less significant than effects on bridges, etc., and (7) incremental fuel requirements for different size and weight trucks can be quantified while assessment of energy requirements for highway construction and maintenance needs further work. GRA

N79-21409# Oregon State Univ., Corvallis. Transportation Research Inst.
THE ENERGY ECONOMIC AND ENVIRONMENTAL CONSEQUENCES OF INCREASED VEHICLE SIZE AND WEIGHT. VOLUME 2: COMPENDIUM OF APPENDICES Final Report, Jul. 1976 - Jan. 1978
R. D. Layton, R. G. Hicks, J. G. Mingle, R. E. Phelps, and W. C. Cantwell Jan. 1978 404 p refs
(Contract DOT-OS-60142)
(PB-290336/7; RSPA-DPB-50-78/27-Vol-2) Avail: NTIS HC A18/MF A01 CSCL 13F

This supplement of the Final Report consists of an introduction, a review of factors affected by increased vehicle size and weight (energy, costs, operations, environmental) including whether these factors are treated from a qualitative, quantitative, or analytical standpoint in the report. Appendices give detailed findings and include a summary of a workshop, review of size and weight regulations and permit operations, evaluation of effect of heavier, larger trucks on pavement life, bridge performance, highway costs, truck performance, traffic operations, truck costs, safety and environmental. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N79-21410*# Martin Marietta Aerospace, Denver, Colo.
DEFINITION OF MUTUALLY OPTIMUM NDI AND PROOF TEST CRITERIA FOR 2219 ALUMINUM PRESSURE VESSELS. VOLUME 1: METHODS
Fred R. Schwartzberg, Richard G. King, and Paul H. Todd, Jr. Feb. 1979 138 p refs 3 Vol.
(Contract NAS3-17790)
(NASA-CR-135445) Avail: NTIS HC A07/MF A01 CSCL 14D

The requirements for proof testing and nondestructive inspection of aluminum pressure vessels were discussed. The following conclusions are (1) lack-of-fusion weld defects are sufficiently tight in the as-welded condition to be considered undetectable; (2) proof-level loads are required to fully open lack-of-fusion weld defects; (3) significant crack opening occurs at subproof levels so that an inspection enhancement loading treatment designed to avoid catastrophic failure is feasible; (4) currently used proof levels for 2219 pressure vessels are adequate for postproof inspection; (5) quantification of defect size and location using collimated ultrasonic pitch-catch techniques appears sufficiently feasible for tankage to warrant developmental work; (6) for short-time single-cycle pressure-vessel applications, postproof inspection is desirable; and (7) for long-term multiple-cycle pressure-vessel applications, postproof inspection is essential for life assurance. Author

N79-21411*# Martin Marietta Aerospace, Denver, Colo.
DEFINITION OF MUTUALLY OPTIMUM NDI AND PROOF TEST CRITERIA FOR 2219 ALUMINUM PRESSURE VESSELS. VOLUME 2: OPTIMIZATION AND FRACTURE STUDIES
Fred R. Schwartzberg, Charles Toth, Jr., Richard G. King, and Paul H. Todd, Jr. Feb. 1979 183 p refs 3 Vol.
(Contract NAS3-17790)
(NASA-CR-135446) Avail: NTIS HC A09/MF A01 CSCL 14D

Certain behavioral aspects associated with fracture and crack extension that cannot be studied using other techniques were evaluated with the ultrasonic method. Characterization of collimated beam techniques showed that significant beam width reduction could be accomplished. Techniques for collimation are given. The crack-opening displacement-gage correction-factor study showed that displacement resulting from crack opening and that from plasticity could be readily differentiated. Crack closure studies using both ultrasonic and crack-opening displacement measurements showed an opening and closing behavior associated with load-unload curves. The results of this work

were in general agreement with the closure concepts of Elber. Ultrasonic measurements used to study the nature of flaw extension characteristics associated with failure of the ligament between the flaw front and back surface showed that penetration could occur by an abrupt fracturing after subcritical growth or by continuous growth. Author

N79-21412*# Martin Marietta Aerospace, Denver, Colo.
DEFINITION OF MUTUALLY OPTIMUM NDI AND PROOF TEST CRITERIA FOR 2219 ALUMINUM PRESSURE VESSELS. VOLUME 3: APPLICATIONS TO RAIL DEFECT EVALUATION
Fred R. Schwartzberg, Charles Toth, Jr., Richard G. King, and Paul H. Todd, Jr. Feb. 1979 35 p 3 Vol.
(Contract NAS3-17790)
(NASA-CR-135447) Avail: NTIS HC A03/MF A01 CSCL 14D

The technique for inspection of railroad rails containing transverse fissure defects was discussed. Both pulse-echo and pitch-catch inspection techniques were used. The pulse-echo technique results suggest that a multiple-scan approach using varying angles of inclination, three-surface scanning, and dual-direction traversing may offer promise of characterization of transverse defects. Because each scan is likely to produce a reflection indicating only a portion of the defect, summing of the individual reflections must be used to obtain a reasonably complete characterization of the defect. The ability of the collimated pitch-catch technique to detect relatively small amounts of flaw growth was shown. The method has a problem in characterizing the portions of the defect near the top surface or web intersection. The work performed was a preliminary evaluation of the prospects for automated mapping of rail flaws. Author

N79-21413# GARD, Inc., Niles, Ill.
INSPECTION OF NUCLEAR REACTOR WELDING BY ACOUSTIC EMISSION Final Report, Nov. 1974 - Nov. 1977
D. W. Prine and T. A. Mathieson Nov. 1978 118 p ref
(Contract AT(49-24)-0187)
(PB-289336/0; NUREG-CR-0461) Avail: NTIS HC A06/MF A01 CSCL 18J

The feasibility and in-process acoustic emission (AE) monitoring of welds to the NDE of Nuclear power component welds are studied. The method was tested under both controlled laboratory conditions and in nuclear fabrication shops. Prototype single and two channel monitors were built and production tested. Over 13,000 feet of weld passes were monitored with excellent correlation of AE to conventional NDE and metallography. AE was proven to be a reliable and practical NDE tool for detection and location of weld flaws. A bank of laboratory controlled weld data providing flaw detection probabilities for various flaw types, AE flaw detection mechanisms, and candidate AE signals parameters for flaw size and type discrimination is analyzed. GRA

N79-21414# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
IMPROVED ULTRASONIC NONDESTRUCTIVE TESTING OF PRESSURE VESSELS Annual Progress Report, 1 Oct. 1977 - 30 Sep. 1978
J. R. Frederick, M. Dixon, C. VandenBroek, D. Papworth, and M. Elzinga Jan. 1979 172 p refs
(Contract NRC-04-75-182)
(PB-291853/0; NUREG-CR-0581) Avail: NTIS HC A08/MF A01 CSCL 14B

Progress in the development of a synthetic aperture focusing technique for ultrasonic pulse-echo flaw evaluation is described. Improvement in display techniques, initial results of a spotlight-mode scanning technique, improvement in deconvolution, an assessment of the ability to identify flaw types, and an assessment of the potential for real-time synthetic-aperture processing of ultrasonic data are discussed. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N79-21415 Engineering Sciences Data Unit, London (England).
NATURAL FREQUENCIES OF THIN-WALLED ISOTROPIC, CIRCULAR-CYLINDRICAL SHELLS
1978 46 p
(ESDU-78004; ISBN-0-85679-226-8) For information on availability of series, subseries, or individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161 HC E99

Graphical and tabulated data for the estimation of the lower natural frequencies of thin-walled unstiffened shells are discussed. Natural frequencies of initially unstressed shells for both flexural and torsional vibration are considered. For each combination of these mode numbers there are three natural frequencies in which the vibrating motion is either primarily radial, axial, or circumferential. Natural frequencies of shells subjected to uniform static loads are considered, and shell modal density data are given. Response calculations of shells under wide band excitation, when using statistical energy analysis methods are studied. The limitations of data presented, and some guidance on the calculation of stiffened shell natural frequencies is given. Applications include estimation of the response of shells subject to high intensity acoustic loading and estimation of natural frequencies of chimneys subject to wind loads. ESDU

N79-21416 Stanford Univ., Calif.
DYNAMICAL RESPONSE OF AN INFINITE ELASTIC MEDIUM TO AXISYMMETRIC LIVELOADS IN A CYLINDRICAL CAVITY Ph.D. Thesis
Aage Peter Jensen 1978 108 p
Avail: Univ. Microfilms Order No. 7905878

The disturbances in an extended isotropic, homogeneous, and linear elastic medium with a cylindrical cavity were studied. The cavity assumes an axisymmetric lineload which varies in time like a Heaviside step-function. With this formulation a broad class of problems is covered; the static Flament's problem, Lamb's problem (when the radius of the hole goes to infinity), and the case with an arbitrary load varying along the axis. The general problem is formulated and a formal solution in form of double transforms of the displacements is obtained. Due to the complexity of the problem the number of variables is reduced in order to forward the solution. The long-time static case, the case of infinite radius, and the first order approximation to surface waves are obtained on integral form. The integration is performed numerically, and it is shown that in first order approximation the Rayleigh-type waves create unbounded displacements when passing. Dissert. Abstr.

N79-21417 Northwestern Univ., Evanston, Ill.
ELASTOSTATIC LOAD-DIFFUSION CHARACTERISTICS OF EMBEDDED AXIALLY-LOADED CYLINDRICAL STRUCTURES Ph.D. Thesis
Vincent Kin-Fei Luk 1978 99 p
Avail: Univ. Microfilms Order No. 7907911

Several three dimensional elastostatic problems of axially-loaded rigid cylindrical inclusions embedded in an elastic medium are investigated. The inclusions which have physical significance as an anchor, a shell and a pile are studied in three separate chapters. The problem of a cylindrical anchor is of interest in connection with the geotechnical study of the time-independent, load-deflection characteristics of deep rigid anchors embedded in cohesive soil or rock media. The results from the cylindrical shell and pile problems provide useful information about the load diffusion behavior of shells and piles under axial loading conditions in an elastic soil mass. The problems are formulated within the scope of the linear theory of elasticity, and isotropy and homogeneity of the elastic medium are assumed. Hankel integral transforms are used to formulate the problems, and numerical solutions are obtained by employing the collocation scheme of Erdogan, Gupta and Cook. Dissert. Abstr.

N79-21418 Northwestern Univ., Evanston, Ill.
STRESS ANALYSIS OF A RIGID BLOCK EMBEDDED IN AN ELASTIC HALF SPACE Ph.D. Thesis
George Konstantinos Haritos 1978 94 p
Avail: Univ. Microfilms Order No. 7907881

The plane elasticity problem of a finite, rigid rectangular block partially embedded in and perfectly bonded to an elastic half space was investigated. The problem is formulated by superposition of the solutions to the problems of horizontal and vertical line inclusions beneath an elastic half space, which are derived from integral transform techniques. Substitution of these results into the boundary conditions appropriate for the embedded block problem leads to a system of six coupled singular integral equations, whose unknowns are the normal and shear stress discontinuities between bonded surfaces. Three distinct sets of loads are applied to the embedded block, so that it either translates without rotation in the x- or y- direction, or rotates about an axis in the z-direction. In all cases, by taking advantage of the symmetric nature of the problems, the number of the governing singular integral equations is reduced. These equations are solved numerically by employing the collocation scheme. Dissert. Abstr.

N79-21419 Northwestern Univ., Evanston, Ill.
AN APPROXIMATE MODEL FOR STATIC AND DYNAMIC ANALYSIS OF FRAMED STRUCTURES Ph.D. Thesis
Weerawat Klud-Um 1978 201 p
Avail: Univ. Microfilms Order No. 7907897

The method can be used to analyze any type of frame that the conventional stiffness method can handle. The major assumptions made are that: the material is linearly elastic, deflections are small, no temperature effect or shear deformations are taken into account and the moment-curvature relation that is used in static analysis also holds in dynamic analysis. In static analysis, the principle of minimum total potential energy is employed. The total potential energy of the frame is expressed in terms of displacements and rotation of the corners of elements. The proposed model also is used in the study of dynamic characteristics of plane frames. The proposed method yields very good approximation for natural frequencies and mode shapes of the lowest antisymmetric modes which are the most important modes in the dynamic response of plane building frames. Dissert. Abstr.

N79-21420 Brown Univ., Providence, R. I.
SOME NUMERICAL STUDIES OF STABLE CRACK GROWTH Ph.D. Thesis
Erik Paul Sorensen 1978 149 p
Avail: Univ. Microfilms Order No. 7906614

The chapters of this thesis comprise separate papers written for publication in the current literature. The following are presented in the chapters: (1) the results of an investigation into stable crack growth under anti-plane strain conditions (viewed as providing guidelines and experience for the more complicated plane strain studies); (2) the plane strain analyses which reveal the nature of stress distributions near the growing crack tip (which permit investigation of fracture criteria proposed for advancing cracks); (3) the development of criteria for continuing fracture; and (4) a scheme central to the numerical analyses. The Appendix extends the discussion of numerical procedures. Dissert. Abstr.

N79-21421 Engineering Sciences Data Unit, London (England).
THE COMPOUNDING METHOD OF ESTIMATING STRESS INTENSITY FACTORS FOR CRACKS IN COMPLEX CONFIGURATIONS USING SOLUTIONS FROM SIMPLE CONFIGURATIONS
1978 19 p
(ESDU-78036; ISBN-0-85679-240-3) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC E99

A method of estimating values of stress intensity factors for cracks that have developed in complex configurations and are close to several boundaries and/or other cracks is presented. The method, which is simple and easy to apply, entails compounding known stress intensity factor solutions for cracks in simple configurations. Typical applications include components or structural elements such as aircraft structures, pressure vessels, rotating and reciprocating machinery etc., in which cracks may develop under working conditions. ESDU

N79-21422*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RECENT ADVANCES IN STRUCTURES FOR HYPERSONIC FLIGHT, PART 1
1978 533 p refs Symp. held at Hampton, Va., 6-8 Sep. 1978
(NASA-CP-2065-Pt-1; L-12653-Pt-1) Avail: NTIS HC A23/MF A01 CSCL 20K

The structures technology required for hypersonic cruise vehicles is reviewed. Engine structures and cooled airframe structures are emphasized. For individual titles, see N79-21423 through N79-21434.

N79-21423*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HYPERSONIC STRUCTURES: AN AERODYNAMICIST'S PERSPECTIVE, OR ONE MAN'S DREAM IS ANOTHER MAN'S NIGHTMARE
J. D. Watts, L. R. Jackson, and J. L. Hunt *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 5-38 (For primary document see N79-21422 12-39)
Avail: NTIS HC A23/MF A01 CSCL 20K

The relationship between hypersonic aerodynamic and structural design is reviewed. The evolution of the hypersonic vehicle design is presented. Propulsion systems, structural materials, and fuels are emphasized. J.M.S.

N79-21424*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRFRAME-INTEGRATED PROPULSION SYSTEM FOR HYPERSONIC CRUISE VEHICLES
Robert A. Jones and Paul W. Huber *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 39-45 refs Presented at the 11th Congr. of the Intern. Council of the Aeron. Sci., Lisbon, 10-16 Sep. 1978 (For primary document see N79-21422 12-39)
Avail: NTIS HC A23/MF A01 CSCL 20K

Research on a new, hydrogen burning, airbreathing engine concept which offers good potential for efficient hypersonic cruise vehicles is considered. Features of the engine which lead to good performance include; extensive engine-airframe integration, fixed geometry, low cooling, and the control of heat release in the supersonic combustor by mixed-modes of fuel injection from the combustor entrance. The engine concept is described along with results from inlet tests, direct-connect combustor tests, and tests of two subscale boiler-plate research engines presently underway at conditions which simulate flight at Mach 4 and 7. J.M.S.

N79-21425*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RECENT ADVANCES IN CONVECTIVELY COOLED ENGINE AND AIRFRAME STRUCTURES FOR HYPERSONIC FLIGHT
H. Neale Kelly, Allan R. Wieting, Charles P. Shore, and Robert J. Nowak *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 47-61 refs Presented at the 11th Congr. of the Intern. Council of the Aeron. Sci., Lisbon, 10-16 Sep. 1978 (For primary document see N79-21422 12-39)
Avail: NTIS HC A23/MF A01 CSCL 20K

A hydrogen-cooled structure for a fixed-geometry, airframe-integrated scramjet is described. The thermal/structural problems, concepts, design features, and technological advances are applicable to a broad range of engines. Convectively cooled airframe structural concepts that have evolved from an extensive series of investigations, the technology developments that have led to these concepts, and the benefits that accrue from their use are discussed. J.M.S.

N79-21426*# AiResearch Mfg. Co., Los Angeles, Calif.
DESIGN AND ANALYSIS OF A SCRAMJET ENGINE
O. A. Buchmann *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 65-119 (For primary document see N79-21422 12-39)
(Contract NAS1-13984)

Avail: NTIS HC A23/MF A01 CSCL 20K

Design concepts defined for the cooled-structures assembly of a hydrogen fueled, regeneratively cooled, airframe-integrated Scramjet engine are considered. Engine subsystems, in particular, the fuel subsystem associated with the operating engine are included along with the engine mounting and the interfacing with the airplane. The engine structure and thermal protection system, including the fuel injection struts are emphasized. J.M.S.

N79-21427*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THERMOSTRUCTURAL ANALYSIS OF A SCRAMJET FUEL-INJECTION STRUT

Allan R. Wieting and Earl A. Thornton (Old Dominion Univ.) *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 120-144 refs (For primary document see N79-21422 12-39)

Avail: NTIS HC A23/MF A01 CSCL 20K

Results of a thermal/structural design analysis study of a fuel injection strut for an airframe integrated hydrogen cooled scramjet are presented. It is indicated that a feasible thermal/structural concept has been identified for the static load conditions and that thermal stresses dominate the response. It is suggested that the response of the concept to dynamic loads be investigated. J.M.S.

N79-21428*# AiResearch Mfg. Co., Los Angeles, Calif.

ADVANCED FABRICATION TECHNIQUES FOR COOLED ENGINE STRUCTURES

O. A. Buchmann *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 145-194 (For primary document see N79-21422 12-39)

(Contract NAS1-14180)

Avail: NTIS HC A23/MF A01 CSCL 20K

An improved design for regeneratively cooled engine structures was identified. This design uses photochemically machined (PCM) coolant passages. It permits the braze joint to be placed in a relatively cool area, remote from the critical hot face sheet. The geometry of the passages at the face sheet also minimizes stress concentration and, therefore, enhances the low cycle fatigue performance. The two most promising alloys identified for this application are Inconel 617 and Nickel 201. Inconel 617 was selected because it has excellent creep rupture properties, while Nickel 201 was selected because of its predicted good performance under low cycle fatigue loading. The fabrication of the PCM coolant passages in both Inconel 617 and Nickel 201 was successfully developed. During fabrication of Inconel 617, undesirable characteristics were observed in the braze joints. A development program to resolve this condition was undertaken and led to definition of an isothermal solidification process for joining Inconel 617 panels. This process produced joints which approach parent metal strength and homogeneity. J.M.S.

N79-21429*# Rocketdyne, Canoga Park, Calif.

HYDROGEN EMBRITTLEMENT AND ITS CONTROL IN HYDROGEN-FUELED ENGINE SYSTEMS

W. T. Chandler *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 1, 1978 p 195-249 refs (For primary document see N79-21422 12-39)

(Contract NAS8-27980)

Avail: NTIS HC A23/MF A01 CSCL 20K

The nature of hydrogen embrittlement by high pressure gaseous hydrogen is described and methods of designing SSME gaseous hydrogen systems, including techniques of hydrogen embrittlement prevention, are discussed. The effects of gaseous hydrogen environments are emphasized. Results of extensive investigations of gaseous hydrogen environments on metals conducted under the SSME program are presented. J.M.S.

N79-21430*# Bell Aerospace Textron, Buffalo, N. Y.

DESIGN AND FABRICATION OF A SKIN STRINGER DISCRETE TUBE ACTIVELY COOLED STRUCTURAL PANEL

Frank M. Anthony *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 253-318 refs (For primary document see N79-21422 12-39)

(Contract NAS1-12806)

Avail: NTIS HC A23/MF A01 CSCL 20K

The design optimization and practical implementation of actively cooled structural panel concepts was investigated. The desired actively cooled structural panel consisted of the cooled skin and a substructure. The primary load carrying components were fabricated from 2024-T3 aliminum alloy. The 3003-H14 coolant passage tubing was chosen because of its excellent corrosion resistance, workability needed to obtain the desired cross sectional shape, and strength. The Epon 951 adhesive was selected for its excellent structural properties and is the thinnest of available films, 0.064 mm. The Eccobond 58C silver filled epoxy was chosen because of its high thermal conductivity, and the alumina filled Epon 828 was chosen for structural and expansion characteristics. J.M.S.

N79-21431*# Rockwell International Corp., Downey, Calif.

DESIGN AND ANALYSIS OF A PLATE-FIN SANDWICH ACTIVELY COOLED STRUCTURAL PANEL

L. M. Smith *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 319-373 refs (For primary document see N79-21422 12-39)

(Contract NAS1-13382)

Avail: NTIS HC A23/MF A01 CSCL 20K

The skin structure of hydrogen fueled hypersonic transport vehicles traveling at Mach 6 and above must be designed to withstand, for relatively long periods of time, the aerodynamic heating effects which are far more severe than those encountered by the supersonic aircraft of today. The use of conventional aircraft materials such as aluminum in combination with forced convection active cooling to accommodate aerodynamic heating is addressed. The basic active cooling concept consists of a stringer stiffened plate-fin sandwich. The sandwich surface is subjected to the aerodynamic heat flux which is transferred, via convection, to a coolant that is forced through the sandwich under pressure. The coolant, in turn, circulates in a closed loop through a hydrogen heat exchanger and back through the skin panel. J.M.S.

N79-21432*# Rockwell International Corp., Downey, Calif. Space Systems Group.

FLUXLESS BRAZING AND HEAT TREATMENT OF A PLATE-FIN SANDWICH ACTIVELY COOLED PANEL

Charles S. Beuyukian *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 375-448 (For primary document see N79-21422 12-39)

Avail: NTIS HC A23/MF A01 CSCL 20K

The processes and techniques used to fabricate plate-fin sandwich actively cooled panels are presented. The materials were 6061 aluminum alloy and brazing sheet having clad brazing alloy. The panels consisted of small scale specimens, fatigue specimens, and a large 0.61 m by 1.22 m test panel. All panels were fluxless brazed in retorts in heated platen presses while exerting external pressure to assure intimate contact of details. Distortion and damage normally associated with that heat treatment were minimized by heat treating without fixtures and solution quenching in an organic polymer solution. The test panel is the largest fluxless brazed and heat treated panel of its configuration known to exist. J.M.S.

N79-21433*# McDonnell Aircraft Co., St. Louis, Mo.

DESIGN AND FABRICATION OF A RADIATIVE ACTIVELY COOLED HONEYCOMB SANDWICH PANEL

Leland C. Koch *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 449-492 refs (For primary document see N79-21422 12-39)

Avail: NTIS HC A23/MF A01 CSCL 20K

The mass of a radiative actively cooled panel was compared to the mass of a bare actively cooled panel designed to the same conditions and constraints. The approach was to design and optimize a 0.61 x 6.1 m full scale panel which combines radiative and active cooling to control structural temperatures to levels compatible with use of lightweight materials and to fabricate a 0.61 x 1.22 m panel for performance testing. Results of the design and optimization of the full scale radiative actively cooled structural panel, including radiative concept selection, final configuration details, test panel description, and conclusions are summarized. J.M.S.

N79-21434*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

RADIATIVE, ACTIVELY COOLED PANEL TESTS RESULTS
Charles P. Shore, Robert J. Nowak, and Ellsworth L. Sharpe *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 1 1978 p 493-536 refs (For primary document see N79-21422 12-39)
Avail: NTIS HC A23/MF A01 CSCL 20K

The radiative, actively cooled panel designed to withstand a uniform incident heat flux of 136 kW/sq m to a 444 K surface temperature was evaluated. The test program consisted of preliminary static thermal mechanical loading and aerothermal flow tests. Test results are briefly discussed. J.M.S.

N79-21436*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RECENT ADVANCES IN STRUCTURES FOR HYPERSONIC FLIGHT, PART 2
1978 408 p refs Symp. held at Hampton, Va., 6-8 Sep. 1978
(NASA-CP-2065-Pt-2; L-12653-Pt-2) Avail: NTIS HC A18/MF A01 CSCL 20K

The papers at this symposium were presented by 24 speakers representing airframe, missile, and engine manufacturers, the U.S. Air Force, and two NASA Research Centers. The papers cover a variety of topics including engine structures, cooled airframe structures, hot structures, thermal protection systems, cryogenic tankage structures, cryogenic insulations, and analysis methods for thermal/structures. For individual titles, see N79-21436 through N79-21445.

N79-21436*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TESTS OF BEADED AND TUBULAR STRUCTURAL PANELS
John L. Shideler, Roger A. Fields, and Lawrence F. Reardon *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 538-576 refs Prepared in cooperation with NASA/Dryden Flight Res. Center (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

Two efficient concepts built from curved elements were identified, and a data base for tubular panels was developed. The tubular panel failure modes were understood, and the data base for these panels indicated that their performance can be predicted. The concepts are currently being tested in a realistic builtup structure; 157 room temperature tests and 67 hot tests were made with no structural failures, although all of these tests were not at the design load of the structure. J.A.M.

N79-21437*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
STRUCTURES FOR HYPERSONIC AIRBREATHING TACTICAL MISSILES
William C. Caywood and Richard M. Rivello *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 577-599 Sponsored in part by Navy (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

The studies to date were encouraging and indicated that materials were available or could be developed to satisfy scramjet requirements. Some of the more promising materials for the critical components were indicated. This information is summarized as follows : (1) radome - Slip cast fused silica is the current candidate, but others are being investigated. One shortcoming of slip cast fused silica is its susceptability to rain damage. (2) inlet leading edges - A refractory metal with a good oxidation protective coating will be required. Tantalum T222 with a Hafnia coating looks promising. (3) inlet ducts - An uninsulated refractory alloy will be required. Columbium F-85 was the best of those considered for the noncircular ducts. (4) external body - The external body temperatures are sufficiently low to permit the use of super alloys. (5) combustor and nozzle - The pyrolytic graphite/silicon carbide coating is very attractive for use in the combustor and nozzle areas. J.A.M.

N79-21438*# Rockwell International Corp., Los Angeles, Calif.
STRUCTURES AND TPS FOR THE NHFRF/HYTID
Harvey J. Hoge *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 601-627 refs (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

The goal of HYTID was to provide a cost effective hypersonic vehicle constructed of near-state-of art systems and structure with sufficient margins to assure no vehicle flight development problems, and to permit concentration of flight operations on hypersonic research with a broad series of experiments carried in a dedicated payload bay or on the exposed surface of the lower aft fuselage. J.A.M.

N79-21439*# Grumman Aerospace Corp., Bethpage, N.Y.
DESIGN AND FABRICATION OF A SUPER ALLOY THERMAL PROTECTION SYSTEM
A. Varisco, W. Wolter, and P. Bell *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 629-669 (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

A lightweight metallic TPS was designed, and two test articles were fabricated, one from Haynes 188 and one from Rene 41. A baseline TPS concept, selected at the beginning of the program, consisted of a Haynes 25 corrugation-stiffened beaded skin surface panel, a specially designed support system, and an insulation system. By optimizing the structure for the design loads and by chem-milling to remove material not needed, the mass of the baseline surface panel was reduced 25%, and the mass of the support structure was reduced 50%. The insulation system mass was reduced 40% by using two types of insulation, each suited to its temperature range, and by eliminating a foul bag which encapsulated the baseline insulation system. These reductions resulted in an overall 35% reduction in mass of the Haynes 188 panel from the baseline Haynes 25 design. Similar reductions were achieved with the Rene 41 system. J.A.M.

N79-21440*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MULTIWALL TPS
L. Robert Jackson *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 671-706 refs (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

A study of multiwall TPS as an alternative to LRSI for the space shuttle indicated that vented multiwall, with foil thicknesses limited to those used in multiwall fabricated to date, is some what heavier than LRSI. With reduced foil thicknesses, multiwall TPS may equal the weight of LRSI. Metallic conduction through multiwall TPS transfered less heat than gas conduction or radiation. Radiation heat transfer was greatest at high temperatures; however, the number of layers selected can significantly reduce radiation. At low-to-intermediate temperatures, gas conduction transfered the most heat through multiwall TPS. Gas conduction may be eliminated by evacuation of panels. Oxidation rates required a trade of foil thickness against life. J.A.M.

N79-21441*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
DRYDEN FLIGHT RESEARCH CENTER HOT STRUCTURES RESEARCH
Roger A. Fields *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 707-750 (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

The facilities, testing techniques, and design methods are described for NASA Dryden Flight Research Center. High temperature strain gage technology, realistic flight hardware fabrication, and structural analysis are discussed. A considerable amount of experimental work on hot structure concepts for hypersonic vehicles was performed; all the work is not complete, and there are still problem areas that need to be resolved. J.A.M.

N79-21442*# Lockheed-California Co., Burbank.
LIQUID HYDROGEN TANKAGE DESIGN
George W. Davis *In* NASA. Langley Res. Center Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 759-806 refs (For primary document see N79-21435 12-39)
(Contract NAS1-14614)
Avail: NTIS HC A18/MF A01 CSCL 20K

For this, the tankage experienced only minor thermal loadings and flight loads, hence, the predominate loading was the tank pressurization. Since the tanks were basically tension designed,

the fatigue and damage tolerance criteria played the most important part in the overall design of the tank. Sensitivity factors were generated for the reference LH2-fueled airplane to provide a basis for evaluation of the effects of changes from the baseline design. For example, the various candidate insulation systems and tank structural concepts offer tradeoffs of the tankage offset distance (distance between exterior surface to tank) and weight. As the offset varies, the aircraft fuselage length must change to provide the required fuel volume within the fixed fuselage cross-section and hence the sensitivity on the aircraft DOC could be assessed. J.A.M.

N79-21443*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXTERNAL INSULATOR FOR LIQUID HYDROGEN TANKS
Ellsworth L. Sharpe *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 807-847 refs (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

With optimized insulation thickness, tank temperatures were always below 311 K (100 F). This conclusion indicated that an aluminum tank could be used with an optimized insulation system if desired. The N2 purged systems were always lighter than CO2 purged systems. The lower condensation temperature was the controlling factor. Closed cell foam systems were lightest. Closed cell foams, in spite of their need for protective outer insulation, produced insulation systems which were lighter than systems which allowed cryodeposition. Foam system durability established for TMAX = 316 K (110 F). Tests for a subsonic application established this durability; higher temperature limit foam durability was unknown at this. An increase in foam TMAX from 316 K (110 F) to 450 K (350 F) potentially decreased TPS mass by 25 percent. J.A.M.

N79-21444*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RECENT ADVANCES IN THERMOSTRUCTURAL FINITE ELEMENT ANALYSIS
Earl A. Thornton and Allan R. Wieting *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 851-896 refs (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

A comparison study is described which has indicated that the finite element and lumped parameter methods are comparable for steady-state conduction/convection analyses. The finite element model was advantageous because of the ease of model verification with computer graphics. Some problems encountered in constructing compatible thermal and structural models have indicated the need for further methodology developments to automate the transition between thermal and structural analyses. The need for more efficient finite element nonlinear transient algorithms has been cited. With further development in the thermal analysis area, the finite element method offers high potential for an integrated thermal/structural analysis capability. J.A.M.

N79-21445*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RECENT ADVANCES IN THERMAL-STRUCTURAL ANALYSIS AND DESIGN
Howard M. Adelman and James C. Robinson *In its* Recent Advan. in Structures for Hypersonic Flight, Pt. 2 1978 p 897-941 refs (For primary document see N79-21435 12-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

A continuing effort to develop a comprehensive capability for thermal-structural analysis and automated design (sizing) is reviewed. A principal role in the activity is played by the finite element program SPAR which contains both an efficient structural and thermal analysis capability. The benefit of having thermal and structural analyses in the same finite element program is illustrated by the application of SPAR to design calculations for the National Transonic Facility - a cryogenic wind tunnel under construction at Langley. Some experience with large-scale thermal structural analysis problems, particularly the space shuttle orbiter, has led to the identification of some analysis needs. Those needs include automated model generation and data output for lumped parameter thermal analysis, faster solution methods for nonlinear transient heat transfer, automated interpolation of temperature data from a thermal finite element model to a dissimilar structural finite model, and automated techniques to identify the times at which the critical combinations of transient heating and loads occur on a structure. J.A.M.

N79-21446*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CRACK PROPAGATION IN ALUMINUM SHEETS REINFORCED WITH BORON-EPOXY
G. L. Roderick Mar. 1979 246 p refs
(NASA-TM-80056) Avail: NTIS HC A11/MF A01 CSCL 20K

An analysis was developed to predict both the crack growth and debond growth in a reinforced system. The analysis was based on the use of complex variable Green's functions for cracked, isotropic sheets and uncracked, orthotropic sheets to calculate inplane and interlaminar stresses, stress intensities, and strain-energy-release rates. An iterative solution was developed that used the stress intensities and strain-energy-release rates to predict crack and debond growths, respectively, on a cycle-by-cycle basis. A parametric study was made of the effects of boron-epoxy composite reinforcement on crack propagation in aluminum sheets. Results show that the size of the debond area has a significant effect on the crack propagation in the aluminum. For small debond areas, the crack propagation rate is reduced significantly, but these small debonds have a strong tendency to enlarge. Debond growth is most likely to occur in reinforced systems that have a cracked metal sheet reinforced with a relatively thin composite sheet. L.S.

N79-21447# National Aerospace Lab., Amsterdam (Netherlands).
EFFECT OF FLIGHT LOAD SPECTRUM VARIATIONS ON FATIGUE LIFE OF RIVETED SPECIMENS AND CRACK PROPAGATION IN SHEET MADE OF ALCLAD 7076-T6
J. B. DeJonge, A. Nederveen, and P. J. Tromp 22 Jun. 1978 57 p refs
(NLR-TR-78071-UCICAF-1060) Avail: NTIS HC A04/MF A01

Riveted specimens that are considered representative for F-27 type wing structure were subjected to comparative flight simulation tests in which the gust load severity and Ground-Air-Ground cycle were systematically varied. The effect of these variations on crack propagation behaviour was studied by means of crack growth tests on 2 mm sheet specimens of 7075-T6 clad material provided with a central sawout. Author

N79-21448# National Aerospace Lab., Amsterdam (Netherlands).
REVIEW OF AERONAUTICAL FATIGUE INVESTIGATIONS IN THE NETHERLANDS DURING THE PERIOD MARCH 1977 - FEBRUARY 1979
J. Schijve, ed. Feb. 1979 41 p refs Presented at the 16th ICAF Conf., Brussels, 14-15 May 1979
(NLR-MP-79006-UCICAF-1081) Avail: NTIS HC A03/MF A01

The topics of the investigation reports are: loads, flight simulation testing, fatigue investigations residual strength and FEM calculations, materials evaluation, fatigue crack growth, and fatigue of aircraft structure and materials. M.M.M.

N79-21449# National Aerospace Lab., Amsterdam (Netherlands).
THE EFFECT OF SHEET EDGE WORKING ON THE FATIGUE LIFE UNDER FLIGHT-SIMULATION LOADING
F. A. Jacobs, J. Schijve, and P. J. Tromp Jul. 1977 30 p refs
(NLR-TR-77095-U) Avail: NTIS HC A03/MF A01

Fatigue tests under flight-simulation loading were performed on unnotched Alclad 2024-T3, anodised 2.0 mm thick sheet specimens, manufactured according to several machine-shop processes applied in the aircraft industry. From the results it appears that milling is preferable to stamping. Rounding off the edges is also advantageous. The effect of anodizing is detrimental. Author

N79-21450*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURAL DYNAMICS TECHNOLOGY RESEARCH IN NASA: PERSPECTIVE ON FUTURE NEEDS
Apr. 1979 37 p refs
(NASA-TM-80078) Avail: NTIS HC A03/MF A01 CSCL 20K

The perspective of a NASA ad hoc study group on future research needs in structural dynamics within the aerospace

industry is presented. The common aspects of the design process across the industry are identified and the role of structural dynamics is established through a discussion of various design considerations having their basis in structural dynamics. The specific structural dynamics issues involved are identified and assessed as to their current technological status and trends. Projections of future requirements based on this assessment are made and areas of research to meet them are identified. J.M.S.

N79-21451# Flow Research, Inc., Kent, Wash.
SHOCK-FITTING FOR FULL POTENTIAL EQUATION Final Report, Jan. 1976 - Apr. 1978
M. M. Hafez and E. M. Murman Dec. 1978 41 p refs
(Contract F40600-76-C-0007)
(AD-A062615; Flow-Research-Note-142; AEDC-TR-78-37) Avail: NTIS HC A03/MF A01 CSCL 20/11

In this report a procedure is considered for fitting shock waves in transonic type-dependent finite-difference relaxation calculations by using the full potential equation. The iterative line relaxation method for transonic finite-difference (rotated or conservative schemes) calculations can be described by a time-dependent equation. The shock-fitting algorithm presented here depends on this unsteady equation. Written in conservative form, the jump condition is derived in terms of shock speed. In the steady-state limit, shock speed vanishes, and the steady shock polar is retained. In this way the jump conditions are imposed iteratively and in a manner consistent with the relaxation procedure that is used everywhere else in the flow field. Preliminary results for axisymmetric flows around a sphere are presented. Application of the algorithm to small-disturbance calculations are discussed in the appendix. Author (GRA)

N79-21452# Army Armament Research and Development Command, Watervliet, N. Y. Benet Weapons Lab.
STRESS CONCENTRATION AROUND INCLINED HOLES IN PRESSURIZED THICK-WALLED CYLINDERS
Y. F. Cheng Nov. 1978 28 p refs
(AD-A063526; AD-E440021; ARLCB-TR-78019) Avail: NTIS HC A03/MF A01 CSCL 20/11

Photoelastic investigation was conducted to study stress concentration around inclined holes in pressurized thick-walled cylinders. It has been found that an inclination in the transverse plane reduces the stress concentration and an inclination in the meridianal plane increases the stress concentration. Also, the stress concentration depends upon the bore-to-hole diameter ratio among other parameters. Author (GRA)

N79-21453# Army Natick Research and Development Command, Mass.
THE STRUCTURAL BEHAVIOR OF PRESSURE-STABILIZED ARCHES
Earl C. Steeves Oct. 1978 158 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A063263; NATICK/TR-78/018) Avail: NTIS HC A08/MF A01 CSCL 13/13

A linear theory for the behavior of pressure-stabilized arches is derived and solutions to the resulting equations are obtained for uniform and concentrated loading for both simply supported and fixed-end restraints. The concentrated load solution is in the form of Green's Function for application to more general loading situations. An experimental investigation of the behavior of pressure-stabilized arches is described, including measurement of fabric stiffness in addition to arch loading. Experimental determinations of the deformation and load-carrying capacity of several arches are correlated with predictions from the theory. These correlations establish the usefulness of the theory as a design tool. GRA

N79-21454# National Bureau of Standards, Washington, D. C. National Measurement Lab.
FRACTURE OF BRITTLE MATERIALS AT HIGH TEMPERATURE Final Report, Jan. 1976 - Dec. 1977
Nancy J. Tighe and Sheldon M. Wiederhorn Wright-Patterson AFB, Ohio AFML Jul. 1978 48 p refs
(Contract F33615-76-F-6752; AF Proj. 2306)
(AD-A063745; AFML-TR-78-83) Avail: NTIS HC A03/MF A01 CSCL 11/2

Ceramic materials offer the potential for significantly increased operating temperatures, increased efficiency and lower costs for gas turbine engines. However, the brittle nature and resulting catastrophic mode of failure of ceramic materials requires a design approach based on consideration of crack nucleation and growth. If both the initial size of pre-existing cracks and the rate at which they grow under an applied stress are known then the time to reach critical size at which failure occurs can be predicted. In principle, the initial size can be determined by non-destructive test techniques. However, state-of-the-art NDT equipment does not have the required sensitivity to detect the flaws in question, which are generally 100 micro m or less. An upper limit on tolerable flaw size can be obtained by proof testing, but the validity of this approach needs to be demonstrated. There is little information on the strength of turbine ceramics which can be used for component design and the relationship between material behavior and microstructure is not well understood. Author (GRA)

N79-21455# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Aeronautical and Astronautical Engineering.
APPROXIMATE FINITE-ELEMENT METHOD OF STRESS ANALYSIS OF NON-AXISYMMETRIC CONFIGURATIONS Final Report, Mar. 1976 - Jun. 1977
Adam R. Zak and James N. Craddock Nov. 1978 34 p
(Contract DAAD05-76-C-0743)
(AD-A063613; AD-E430158; ARBRL-CR-00387) Avail: NTIS HC A03/MF A01 CSCL 13/13

A finite element method of analysis is developed for structural configurations which are derived from axisymmetric geometries but contain definite nonaxisymmetric features in the circumferential direction. The purpose of the present analysis is to develop a method which will take into consideration the fact that the stress and strain conditions in these geometries will be related to the corresponding axisymmetric solution. To analyze these structures the geometry is divided into several segments in the r-theta plane. The axisymmetric displacements are obtained for each segment by solving a related axisymmetric configuration. A perturbation analysis is then performed to match the solutions at certain points between the segments, and obtain the perturbation displacements for the total structure. The total displacement is then the axisymmetric displacement plus the perturbation displacement. The stresses and strains are then calculated at any desired point once the total displacements are known. The method is applied to a number of examples to illustrate the accuracy of the method. The results of these examples are presented and discussed. Author (GRA)

N79-21456# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
DYNAMIC PLASTIC RESPONSE OF CIRCULAR PLATES WITH TRANSVERSE SHEAR AND ROTATORY INERTIA Interim Report
Norman Jones and J Gomes Deoliveira Dec. 1978 46 p refs
(Contract N00014-76-C-0195)
(AD-A063561; Rept-78-9) Avail: NTIS HC A03/MF A01 CSCL 12/1

The response of a simply supported circular plate made from a rigid perfectly plastic material and subjected to a uniformly distributed impulsive velocity is developed herein. Plastic yielding of the material is controlled by a yield criterion which retains the transverse shear force as well as bending moments and the influence of rotatory inertia is included in the governing equations. Various equations and numerical results are presented which may be used to assess the importance of transverse shear effects and rotatory inertia for this particular problem. Author (GRA)

N79-21457# Ottawa Univ. (Ontario). Dept. of Civil Engineering.
COMPUTER PROGRAM WARPT1 (WARPING TORSIONAL CROSS-SECTIONAL CONSTANTS). WARPT1 COMPUTER PROGRAM FOR WARPING TORSIONAL CONSTANTS
Petar Krpan Nov. 1978 37 p
(PB-291298/8; OUO/DCE-78/1) Avail: NTIS HC A03/MF A01 CSCL 13B

The user's manual and computer program for computation of warping torsional constants for an arbitrarily shaped thin-walled open cross-section (without 'branch-offs'), made of linearly elastic or inelastic material is presented. The output contains the following

information for uncracked cross-section without reinforcement, uncracked cross-section with reinforcement, linearly elastic cracked cross-section with reinforcement and nonlinearity elastic (and elastic-plastic) cracked cross-section with reinforcement for several values of bimoment: moments and products of inertia; position of the shear center; values of the principal omega coordinates for all the joints and reinforcement positions; sectorial moment of inertia; ordinates of S sub omega diagram for steel and concrete; curvature for given values of bimoment; and strain in steel for given values of bimoment. GRA

N79-21458# Texas Technological Univ., Lubbock. Inst. for Disaster Research.

THE EFFECTS OF THICKNESS AND TEMPER ON THE RESISTANCE OF GLASS TO SMALL MISSILE IMPACT Final Report

Philip L. Harris, W. Lynn Beason, and Joseph E. Minor May 1978 98 p refs

(Grant NSF ENG-74-24406)

(PB-291014/9; TTU/IDR-40D) Avail: NTIS HC A05/MF A01 CSCL 11B

Two predominate modes of failure characterize window glass breakage uniform wind pressure and missile impact. Effects of sample thickness, temper, and missile weight on impact resistance of glass are discussed. Linear regressions were performed to relate these parameters to the velocity required to break various samples. Minimum velocity to break annealed glass differed from that for heat treated glass. Missile weight was more significant for annealed glass. The degree of heat treatment appeared to affect missile resistance. The minimum velocity to break a sample did not occur in the smallest thickness. The stress wave theory appears to best explain data trends. GRA

N79-21459# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

STRUCTURAL FATIGUE HANDBOOK. VOLUME 2: CAUSES AND PREVENTION OF DAMAGE. CHAPTER 7: SURFACE DAMAGE MECHANICS [MANUEL SUR LA FATIGUE DES STRUCTURES. VOL. 2. CAUSES ET PREVENTION DE L'ENDOMMAGEMENT. CHAPITRE 7. ENDOMMAGEMENT MECANIQUE DE LA SURFACE]

W. G. Barrois Dec. 1978 122 p refs In FRENCH

(AGARD-MAN-10; ISBN-92-835-2105-6) Copyright. Avail: NTIS HC A06/MF A01

Practical aspects of various of structural surface fractures are reviewed and compared. These processes can be at the origin of defects or of the final rupture by fatigue or stress corrosion under the influence of loads applied during use. Such damages are provoked by flaws in heat treatment, rectification in grinding, wear, fatigue from rolling, and from contact or sliding friction as well as from abrasion, the erosion by liquid or solid particles or cavitation. Despite apparent differences, the elementary processes of these fracture modes present a real uniformity and involve an initial fatigue phase by repeated plastic deformations. On a microscopic scale, corresponding alternate constraints involve the detachment of particles in each of these processes. It is shown that the essential act of corrosion is limited by the oxidation of residue in laboratory tests, but can have a more complex effect in actual structures in use or over very long periods of time. Transl. by A.R.H.

42 GEOSCIENCES (GENERAL)

N79-21460*# Ohio State Univ., Columbus. Dept. of Geodetic Science.

APPLICATIONS OF GEODESY TO GEODYNAMICS, AN INTERNATIONAL SYMPOSIUM Final Report

Ivan I. Mueller, ed. 1978 354 p refs Presented at the 9th Geodesy/Solid Earth and Ocean Phys. (GEOP) Res. Conf., Columbus Ohio, 2-5 Oct. 1978; sponsored by NASA, NOS/NOSS, Geol. Surv., Defense Mapping Agency and Ohio State Univ.

(Contract NASw-3194; OSURF Proj. 711022)

(Rept-280) Avail: NTIS HC A16/MF A01 CSCL 08E

Geodetic techniques in detecting and monitoring geodynamic phenomena are reviewed. Specific areas covered include: rotation of the earth and polar motion; tectonic plate movements and crustal deformations (space technigues); horizontal crustal movements (terrestrial techniques); vertical crustal movements (terrestrial techniques); gravity field, geoid, and ocean surface by space techniques; surface gravity and new techniques for the geophysical interpretation of gravity and geoid undulation; and earth tides and geodesy. For individual titles, see N79-21461 through N79-21512.

N79-21461*# Australian National Univ., Canberra. Research School of Earth Sciences.

PROGRESS IN GEOPHYSICAL ASPECTS OF THE ROTATION OF THE EARTH c46

Kurt Lambeck *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 1-11 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08E

The geophysical causes and consequences of the Earth's rotation are reviewed. Specific topics covered include: (1) the motion of the rotation axis in space, precession and nutation; (2) the motion of the rotation axis relative to the Earth, polar motion; and (3) the rate of rotation about this axis, or changes in the length of day. Secular decrease in obliquity and evolution of the Earth-Moon system are also discussed. J.M.S.

N79-21462*# Bureau International de l'Heure, Paris (France).

ROTATION OF THE EARTH AND POLAR MOTION, SERVICES c46

Bernard Guinot *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 13-18 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08E

The services providing polar motion and universal time data are described. The precision and accuracy of these data are estimated. J.M.S.

N79-21463*# Technische Hogeschool, Delft (Netherlands). Dept. of Geodesy.

EARTH ROTATION AND POLAR MOTION FROM LASER RANGING TO THE MOON AND ARTIFICIAL SATELLITES c46

L. Aardoom *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 19-28 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08E

Earth-based laser ranging to artificial satellites and to the moon is considered as a technique for monitoring the Earth's polar motion and diurnal rotation. The kinematics of Earth rotation as related to laser ranging is outlined. The current status of laser ranging as regards its measuring capabilities is reviewed. The relative merits of artificial satellite and lunar laser ranging are pointed out. It appears that multistation combined artificial satellite and lunar laser ranging is likely to ultimately meet a 0.002 arcseconds in pole position and 0.1 msec in UT1 daily precision requirement. Author

N79-21464*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.

PRINCIPLES OF VERY-LONG-BASELINE INTERFEROMETRY c46

Irwin I. Shapiro *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 29-33 refs Sponsored in part by NASA and NSF (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08E

The basic principles of very-long-baseline interferometry as related to its use in the determination of vector baselines, polar motion, and earth rotation are presented. Aspects relevant to geodetic applications that involve observations of extragalactic radio sources are covered. The instrumentation used in these observations and the basic observables and their simplest interpretation are described. Complications of the interpretation due to the various geophysical 'signals' and nongeophysical 'noise' that affect the observables are considered. J.M.S.

N79-21465*# Michigan Univ., Ann Arbor. Dept. of Geology and Mineralogy.

POLAR WANDER ANALYSIS FROM PALEOMAGNETIC

DATA c46

Rob VanderVoo *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 35-37 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08E

Utilizing marine magnetic anomalies and paleomagnetic pole positions, paleogeographic maps were constructed for three time intervals back to the Early Cretaceous. From the maps lithospheric plate motions were calculated and these global displacement fields were analyzed to determine best-fitting rigid rotations, which then could be ascribed to true polar wander. The values so obtained are no larger than a few degrees and are within the magnitude of the uncertainties involved. J.M.S.

N79-21466*# National Aeronautics and Space Administration, Washington, D. C.

PRESENT STATUS AND FUTURE PROSPECTS FOR NASA'S PROGRAM IN GEODYNAMICS c46

Edward A. Flinn *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 39 (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08E

An overview of NASA's involvement in developing systems for precise determination of polar motion, earth rotation, and position on the earth's surface is given. The observational methods discussed are laser ranging to the moon and to artificial satellites, and very long baseline microwave interferometry. A plan for a geodynamics program to apply space technology to research in earth dynamics is outlined. J.M.S.

N79-21467*# McDonald Observatory, Austin, Tex.

MOBILE SATELLITE RANGING c15

Eric C. Silverberg *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 41-46 refs (For primary document see N79-21460 12-42)

(Contract NASw-2974)

Avail: NTIS HC A16/MF A01 CSCL 22D

A brief review of the constraints which have limited satellite ranging hardware and an outline of the steps which are underway to improve the status of the equipment in this area are given. In addition, some suggestions are presented for the utilization of newer instruments and for possible future research and development work in this area. J.M.S.

N79-21468*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

MOBILE RADIO INTERFEROMETRIC GEODETIC SYSTEMS c46

P. F. MacDoran, A. E. Niell, K. M. Ong, G. M. Resch, D. D. Morabito, E. S. Claflin, and T. G. Lockhart *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 47-51 refs (For primary document see N79-21460 12-42)

(Contract NAS7-100)

Avail: NTIS HC A16/MF A01 CSCL 08E

Operation of the Astronomical Radio Interferometric Earth Surveying (ARIES) in a proof of concept mode is discussed. Accuracy demonstrations over a short baseline, a 180 km baseline, and a 380 km baseline are documented. Use of ARIES in the Sea Slope Experiment of the National Geodetic Survey to study the apparent differences between oceanographic and geodetic leveling determinations of the sea surface along the Pacific Coast is described. Intergration of the NAVSTAR Global Positioning System and a concept called SERIES (Satellite Emission Radio Interferometric Earth Surveying) is briefly reviewed. J.M.S.

N79-21469*# Naval Surface Weapons Center, Dahlgren, Va.

APPLICATION OF GLOBAL POSITIONING SYSTEM TO DETERMINATION OF TECTONIC PLATE MOVEMENTS AND CRUSTAL DEFORMATIONS c46

R. J. Anderle *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp 1978 p 53-57 ref (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08G

It is shown that pseudo-range measurements to four GPS satellites based on correlation of the pseudo random code transmissions from the satellites can be used to determine the relative position of ground stations which are separated by several hundred kilometers to a precision at the centimeter level. Carrier signal measurements during the course of passage of satellites over a pair of stations also yield centimeter precision in the relative position, but oscillator instabilities limit the accuracy. The accuracy of solutions based on either type of data is limited by unmodeled tropospheric refraction effects which would reach 5 centimeters at low elevation angles for widely separated stations. J.M.S.

N79-21470*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SPACEBORNE RANGING SYSTEM c36

David E. Smith *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 59-64 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 20E

A spaceborne laser ranging system is described that could survey a large network of ground reflectors, and provide their relative locations to a precision of + or - 1 cm. This performance is believed realizable for networks covering up to 10 to 6th power square kilometers and from only a few days of observations. This system could be used to monitor crustal movements in many areas of the world and has the potential to provide an almost real-time system for detecting precursory ground motions before large earthquakes. Author

N79-21471*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.

MINIATURE INTERFEROMETER TERMINALS FOR EARTH SURVEYING c32

Charles C. Counselman, III and Irwin I. Shapiro *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 65-85 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 17B

A system of miniature radio interferometer terminals was proposed for the measurement of vector baselines with uncertainties ranging from the millimeter to the centimeter level for baseline lengths ranging, respectively, from a few to a few hundred kilometers. Each terminal would have no moving parts, could be packaged in a volume of less than 0.1 cu m, and would operate unattended. These units would receive radio signals from low-power (< 10 w) transmitters on earth-orbiting satellites. The baselines between units could be determined virtually instantaneously and monitored continuously as long as at least four satellites were visible simultaneously. J.A.M.

N79-21472*# National Geodetic Survey, Rockville, Md.

MONITORING REGIONAL CRUSTAL DEFORMATION WITH HORIZONTAL GEODETIC DATA c46

R. A. Snay and J. G. Gergen *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 87-92 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08G

The National Ocean Survey is developing an automated system to derive parameters of horizontal crustal motion from existing geodetic data by the process of least squares estimation. The estimated parameter will describe crustal motion as a function of geographic position. The system will first be tested in the Imperial Valley region of southern California, using data from 8 individual field projects spanning four decades of time. Author

N79-21473*# Geological Survey, Menlo Park, Calif.

STRAIN PATTERNS AND STRAIN ACCUMULATION ALONG PLATE MARGINS c46

J. C. Savage *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 93-97 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08G

Observations of strain accumulation along plate margins in Japan, New Zealand, and the United States indicate that: (1) a typical maximum rate of secular strain accumulation is on the order of 0.3 ppm/a, (2) a substantial part of the strain accumulation process can be attributed to slip at depth on the major plate boundary faults, and (3) some plastic deformation in a zone 100 km or more in width is apparently involved in the strain accumulation process. Author

N79-21474*# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.

MULTIPLE WAVELENGTH GEODESY c46

Judah Levine *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 99-102 refs (For primary document see N79-21460 12-42)
(Grant NsG-7344)
Avail: NTIS HC A16/MF A01 CSCL 08E

An apparatus is being constructed which should be able to measure baselines up to 50 km long with a fractional uncertainty of about 5 x 10 to the -8 power. The instrument will measure both the optical length and the required correction due to the refractivity of the atmosphere, using three wavelengths transmitted in one direction over the path to an active receiver. The three wavelengths are 632.8 nm, 441.6 nm and 3.7 cm. The two endpoint instruments are synchronized using subsidiary return transmissions at 632.8 nm and another telemetry signal. The one-way nature of the system allows an increase in range over existing round-trip systems. J.A.M.

N79-21475*# Rome Univ. (Italy). Inst. di Fisica.
PROBLEMS AND ADVANCES IN MONITORING HORIZONTAL STRAIN **c46**
Michele Caputo *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 103-109 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

The modern instrumentation is described for use in geodesy for the detection of the deformations of the crust of the earth. Problems are listed. Needs are discussed for the survey of the physical quantities of interest in geodesy, geology, geophysics, and engineering such as the strain invariants, the optimal network of baselines and the accuracy. An analytic method is also given for the computation of the effect of a source of dilatation in a spherical earth. J.A.M.

N79-21476*# Technical Univ., Milan (Italy). Inst. of Surveying.
DETECTION OF HORIZONTAL CRUSTAL MOVEMENTS BY PHOTOGRAMMETRIC METHODS **c46**
Luigi Solaini *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 111-112 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

The photogrammetric methods can be applied only if the horizontal displacements of the ground are of the order of several centimeters, because the standard error of the points so determined cannot, at the present time, be smaller than two centimeters. The procedure to be adopted, which has already been applied with satisfactory results for the densification of geodetic nets, is the aerial analytical triangulation. The taking can be executed with wide-angle cameras (f = 15 cm), or normal-angle cameras (f = 30 cm) and format 23 x 23 cm. Since the average scale of photos must be chosen in relation with the desired accuracy and then is independent of the principal distance of the cameras, the number of photos is constant, whereas the flying height varies according to the focal length. J.A.M.

N79-21477*# Universidad del Zulia Maracaibo (Venezuela). Escuela de Geodesia.
LOCAL PRECISION NETS FOR MONITORING MOVEMENTS OF FAULTS AND LARGE ENGINEERING STRUCTURES **c46**
Heinz G. Henneberg *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 113-130 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

Along Bocono Fault were installed local high precision geodetic nets to observe the possible horizontal crustal deformations and movements. In the fault area there are few big structures which are also included in the mentioned investigation. In the near future, measurements shall be extended to other sites of Bocono Fault and also to the El Pilar Fault. In the same way and by similar methods high precision geodetic nets are applied in Venezuela to observe the behavior of big structures, as bridges and large dams and of earth surface deformations due to industrial activities. Author

N79-21478*# Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
GEODETIC MEASUREMENTS AT SEA FLOOR SPREADING CENTERS **c48**
F. N. Spiess *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 131-136 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08C

A network of 8 or more precision transponder units mounted on the sea floor and interrogated periodically from an instrument package towed near bottom through the area to provide the necessary spatial averaging could provide a practical system for observing the pattern of buildup of strain at intermediate and fast spreading centers. J.A.M.

N79-21479*# Flinders Univ., Bedford Park (Australia). School of Earth Sciences.
SEA LEVEL DATA AND TECHNIQUES FOR DETECTING VERTICAL CRUSTAL MOVEMENTS **c46**
G. W. Lennon *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 137-143 ref (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

An attempt is made to survey problems, requirements, and the outlook for the future in the study of sea level time series so as to determine the relative movement of land and sea levels. The basic aim is to eliminate from the record the contributions from whatever marine dynamic phenomena respond to treatment, allowing the secular element to be identified with optimum clarity. Nevertheless the concept of sea level perturbation varies according to regional experience. The recent work of the Permanent Service for Mean Sea Level helps to eliminate geodetic noise from the series and makes it possible, perhaps, to treat the global mean sea level data bank so as to define eustatic changes in ocean volume which, in the present context, may be regarded as the final goal, allowing the identification of vertical crustal motion itself. Author

N79-21480*# New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
MODELLING OF PHYSICAL INFLUENCES IN SEA LEVEL RECORDS FOR VERTICAL CRUSTAL MOVEMENT DETECTION **c46**
Edward G. Anderson *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 145-152 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

Attempts to specify and evaluate such physical influences are reviewed with the intention of identifying problem areas and promising approaches. An example of linear modelling based on air/water temperatures, atmospheric pressure, river discharges, geostrophic and/or local wind velocities, and including forced period terms to allow for the long period tides and Chandlerian polar motion is evaluated and applied to monthly mean sea levels recorded in Atlantic Canada. Refinement of the model to admit phase lag in the response to some of the driving phenomena is demonstrated. Spectral analysis of the residuals is employed to assess the model performance. The results and associated statistical parameters are discussed with emphasis on elucidating the sensitivity of the technique for detection of local episodic and secular vertical crustal movements, the problem areas most critical to the type of approach, and possible further developments. L.S.

N79-21481*# Geological Survey, Menlo Park, Calif.
THE GRAVITY METHOD AND INTERPRETIVE TECHNIQUES FOR DETECTING VERTICAL CRUSTAL MOVEMENTS **c46**
Robert C. Jachens *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 153-155 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

Observations of temporal variations of gravity can be used as an inexpensive and rapid means of detecting, monitoring, and studying crustal deformation associated with many active geological processes. Such observations can yield qualitative or semiquantitative information on elevation changes and, when combined with independent elevation data, can yield information about changes of the subsurface density field arising from both subsurface displacements and temporal variations of the density of materials in the subsurface. The effectiveness of gravity

techniques in specific cases of crustal deformation depends on the configuration of the local gravity field, the physical processes involved in the deformation, and the accuracy with which temporal gravity variations can be measured. L.S.

N79-21482*# Earth Physics Branch, Ottawa (Ontario). Gravity and Geodynamics Div.
REVIEW OF CANADIAN EXPERIENCE IN PRECISE GRAVIMETRY c46
Anthony Lambert *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 157-158 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

Results of gravity observations made in Canada from 1974 to 1978 reviewed, in order to estimate the true accuracy of present-day gravimetry and thereby assess the potential capability of the method for detecting crustal movements. The standard error of the mean of ties is 15-20 nm/s squared. Inter-instrument comparisons and other tests show, however, that a more realistic estimate of D meter accuracy is 30-40 nm/s squared. This accuracy can only be maintained over the long term where uncertainties in gravimeter calibration curves are minimized by resetting to the same dial reading on the resurveys. A further deterioration in accuracy to 40-50 nm/s squared occurs where reliance is placed on presently available D meter calibration curves. Despite the present accuracy limitations significant time variations in gravity of 100-150 nm/s squared are seen over spatial scales of 10-100 kilometers in Canada over a period of several months. L.S.

N79-21483*# Universidad del Zulia Maracaibo (Venezuela). Escuela de Ingenieria Geodesica.
INVESTIGATIONS ON VERTICAL CRUSTAL MOVEMENTS IN THE VENEZUELAN ANDES BY GRAVIMETRIC METHODS c46
Hermann Drewes *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 159-163 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

A precise gravimetric network has been installed in the Venezuelan Andes to study eventual gravity changes due to vertical tectonic movements. The design and the measurements of the network are described and the accuracy is estimated. In the center of the region a local gravity network has been reobserved three times. The detected variations are discussed. In order to obtain a genuine statement as far as possible about the significance of observed gravity changes, requirements for the procedure of monitoring precise gravity networks are pointed out. Author

N79-21484*# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE MEASUREMENT OF LONG PERIOD AND SECULAR DEFORMATION WITH DEEP BOREHOLE TILTMETERS c46
Gerry H. Cabaniss *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 165-169 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

Two clusters of instruments were emplaced in fractured bedrock in eastern Massachusetts in 1970 and 1975. The intrasite agreement at tidal periods was about two percent, but there is no agreement at longer periods. A strong temperature-induced annual component ranging from 3 to 15 urads was present on instruments installed at depths of 15-20m; it was not apparent on those at 100-120m. One instrument, in continuous operation for three years at 100m, showed a net drift of 0.3 urads down to the SW, with a maximum departure of 2.0 urads from the trend. Pore pressure variations, material corrosion and creep, and local movements are apparently the limiting factors to long-term measurements. L.S.

N79-21485*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
APPLICABILITY OF APT AIDED-INERTIAL SYSTEM TO CRUSTAL MOVEMENT MONITORING c46
J. Arnold Soltz *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 177-182 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

The APT system, its stage of development, hardware, and operations are described. The algorithms required to perform the real-time functions of navigation and profiling are presented. The results of computer simulations demonstrate the feasibility of APT for its primary mission: topographic mapping with an accuracy of 15 cm in the vertical. Also discussed is the suitability of modifying APT for the purpose of making vertical crustal movement measurements accurate to 2 cm in the vertical, and at least marginal feasibility is indicated. Author

N79-21486*# National Geodetic Survey, Rockville, Md.
MODELS FOR EXTRACTING VERTICAL CRUSTAL MOVEMENTS FROM LEVELING DATA c46
Sandford H. Holdahl *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 183-190 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

Various adjustment strategies are being used in North America to obtain vertical crustal movements from repeated leveling. The more successful models utilize polynomials or multiquadric analysis to describe elevation change with a velocity surface. Other features permit determination of nonlinear motions, motions associated with earthquakes or episodes, and vertical motions of blocks where boundaries are prespecified. The preferred models for estimating crustal motions permit the use of detached segments of releveling to govern the shape of a velocity surface and allow for input from nonleveling sources such as tide gages and paired lake gages. Some models for extracting vertical crustal movements from releveling data are also excellent for adjusting leveling networks, and permit mixing old and new data in areas exhibiting vertical motion. The new adjustment techniques are more general than older static models and will undoubtedly be used routinely in the future as the constitution of level networks becomes mainly relevelings. Author

N79-21487*# Naval Surface Weapons Center, Dahlgren, Va.
GRAVITY FIELD, GEOID AND OCEAN SURFACE BY SPACE TECHNIQUES c46
Richard J. Anderle *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 193-196 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

Knowledge of the earth's gravity field continued to increase during the last four years. Altimetry data from the GEOS-3 satellite has provided the geoid over most of the ocean to an accuracy of about one meter. Increasing amounts of laser data has permitted the solution for 566 terms in the gravity field with which orbits of the GEOS-3 satellite have been computed to an accuracy of about one to two meters. The combination of satellite tracking data, altimetry and gravimetry has yielded a solution for 1360 terms in the earth's gravity field. A number of problems remain to be solved to increase the accuracy of the gravity field determination. New satellite systems would provide gravity data in unsurveyed areas and correction for topographic features of the ocean and improved computational procedures together with a more extensive laser network will considerably improve the accuracy of the results. Author

N79-21488*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
RECENT ADVANCES IN ANALYTICAL SATELLITE THEORY c13
E. M. Gaposchkin *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 197-206 refs (For primary document see N79-21460 12-42)
(Contract F19628-78-C-0216)
Avail: NTIS HC A16/MF A01 CSCL 22A

Recent work on analytical satellite perturbation theory has involved the completion of a revision to 4th order for zonal harmonics, the addition of a treatment for ocean tides, an extension of the treatment for the noninertial reference system, and the completion of a theory for direct solar-radiation pressure and earth-albedo pressure. Combined with a theory for tesseral-harmonics, lunisolar, and body-tide perturbations, these formulations provide a comprehensive orbit-computation program. Detailed comparisons with numerical integration and observations are presented to assess the accuracy of each theoretical development. Author

N79-21489*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT ADVANCES IN COMPUTATIONAL TECHNIQUES **c13**
David E. Smith *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 207-211 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 22A

The determination of very precise orbits and geodynamic parameters from laser tracking data requires the continual development and improvement of the software systems and computational techniques. Computational accuracies at the few centimeter level are presently required to match the performance of the present day laser ranging systems and altimeters and in the next few years the accuracies are expected to increase further. The major error sources in orbit determination are briefly discussed and the present and future modeling activities needed to meet the accuracy requirements of the next few years are described. Author

N79-21490*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
A DRAG-FREE LO-LO SATELLITE SYSTEM FOR IMPROVED GRAVITY FIELD MEASUREMENTS **c15**
Robert E. Fischell and Vincent L. Pisacane *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 213-219 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 22B

At very low altitudes, the effect of atmospheric drag results in drastically reduced orbit lifetimes and considerable uncertainty in satellite motions. The concept suggested herein employs a DISturbance COmpensation System (DISCOS) on each of a pair of satellites at very low altitudes to provide refined measurements of the earth's gravitational field. The DISCOS maintains the satellites in orbit and essentially eliminates motion uncertainties due mostly to drag and to a lesser extent from solar radiation pressure. By a closed-loop measurement of the relative rangerate between the two low satellites, one can determine the earth's gravitational field with a considerably greater accuracy than could be obtained by tracking a single satellite. Author

N79-21491*# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Astronomische und Physikalische Geodasaesie.
IMPROVEMENTS OF THE GRAVITY FIELD FROM SATELLITE TECHNIQUES AS PROPOSED TO THE EUROPEAN SPACE AGENCY **c46**
C. Reigber *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 221-232 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

A summary of the European Earth Sciences Space Programme and the requirements for each gravity field mapping resulting from this programme are given. Three satellite experiments for gravity field improvement proposed to the European Space Agency in the last years are shortly characterized. One of these experiments, the low-low-SST-SLALOM experiment, based on laser interferometry for a 'two target-one Spacelab telescope' configuration, is discussed in more detail. Reasons for the low-low concept selection are given and some mission aspects and a possible system concept for a compact ranging, acquisition and tracking system are presented. Author

N79-21492*# Woods Hole Oceanographic Institution, Mass.
PROBLEMS IN DETERMINING SEA SURFACE TOPOGRAPHY **c48**
John A. Whitehead, Jr. *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 233-236 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08C

Anticipated problems for determining ocean dynamics signals from sea surface topography are discussed. The needs for repeated tracks are listed if oceanic tides or ocean turbulence are to be determined. Author

N79-21493*# Ohio State Univ., Columbus. Dept. of Geodetic Science.
WORLD GRAVITY STANDARDS **c46**
Urho A. Uotila *In its* Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 237-238 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

In order to use gravity anomalies in geodetic computations and geophysical interpretations, the observed gravity values from which anomalies are derived should be referred to one consistent world wide system. The International Gravity Standardization Net 1971 was adapted by the International Union of Geodesy and Geophysics at Moscow in 1971, the network was result of extensive cooperation by many organizations and individuals around the world. The network contains more than 1800 stations around the world. The data used in the adjustment included more than 25,000 gravimetry, pendulum and absolute measurements. G.Y.

N79-21494*# Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
THE MEASUREMENT OF SURFACE GRAVITY **c46**
J. C. Harrison and L. J. B. LaCoste (LaCoste and Romberg, Inc., Austin Tex.) *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 239-243 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

LaCoste and Romberg G and D gravity meters are normally employed when attempting high precision measurement of gravity differences on land. The capabilities and limitations of these instruments are discussed. G.Y.

N79-21495*# Air Force Geophysics Lab., Hanscom AFB, Mass. Terrestrial Sciences Div.
THE AFGL ABSOLUTE GRAVITY PROGRAM **c46**
James A. Hammond and Robert L. Iliff *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 245-249 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

A brief discussion of the AFGL's (Air Force Geophysics Laboratory) program in absolute gravity is presented. Support of outside work and in-house studies relating to gravity instrumentation are discussed. A description of the current transportable system is included and the latest results are presented. These results show good agreement with measurements at the AFGL site by an Italian system. The accuracy obtained by the transportable apparatus is better than 0.1 microns sq sec 10 microgal and agreement with previous measurements is within the combined uncertainties of the measurements. Author

N79-21496*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
PRESENT STATUS OF MARINE GRAVITY **c46**
A. B. Watts *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 251-255 refs (For primary document see N79-21460 12-42)
(Contract N00014-75-C-0210; Grants NSF OCE-77-07941; NSF OCE-77-10647; NSF OCE-77-25993)
Avail: NTIS HC A16/MF A01 CSCL 08N

The technique of measuring gravity at sea was greatly improved by the development of spring-type surface-ship gravimeters which can be operated in a wide variety of sea conditions. A brief review of the most recent developments in marine gravity is presented. The extent of marine gravity data coverage is illustrated in a compilation map of the world's free-air gravity anomaly maps of the world's oceans. A brief discussion of some of the main results in the interpretation of marine gravity is given. Some comments made on recent determinations of the gravity field in oceanic regions using satellite radar altimeters are also presented. G.Y.

N79-21497*# Cornell Univ., Ithaca, N. Y. Dept. of Geological Sciences.
GEOID ANOMALIES AND THE NEAR-SURFACE DIPOLE DISTRIBUTION OF MASS **c46**
D. L. Turcotte and J. R. Ockendon (Oxford Univ.) *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 257-260 refs (For primary document see N79-21460 12-42)
(Grant NsG-5060)
Avail: NTIS HC A16/MF A01 CSCL 08E

Although geoid or surface gravity anomalies cannot be uniquely related to an interior distribution of mass, they can be

related to a surface mass distribution. However, over horizontal distances greater than about 100 km, the condition of isostatic equilibrium above the asthenosphere is a good approximation and the total mass per unit column is zero. Thus the surface distribution of mass is also zero. For this case we show that the surface gravitational potential anomaly can be uniquely related to a surface dipole distribution of mass. Variations in the thickness of the crust and lithosphere can be expected to produce undulations in the geoid. Author

N79-21498*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.

INTERPRETATION OF ALTIMETER DATA **c32**

Micheline C. Roufosse *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 261-266 refs (For primary document see N79-21460 12-42)

(Contract F19628-78-C-0003)

Avail: NTIS HC A16/MF A01 CSCL 17B

Two methods are used to interpret the whole range of signals contained in the Geos 3 altimeter data. They each address a different class of events and thus complement each other in their ability to provide information on the state of convection in the earth's mantle. The long wavelength section of the spectrum yields information on the depth of convection cells and the viscosity variations inside those cells through a study of the variations of the admittance as a function of wavelength. The short wavelength section of the spectrum provides information on the evolution of the lithosphere, considered as a thin elastic plate, by studying its response to loads at several points in its evolution. The variation of the flexural rigidity with age is obtained from that study.

Author

N79-21499*# Ohio State Univ., Columbus. Dept. of Geodetic Science.

COMPARISON OF SURFACE AND SATELLITE GRAVITY DATA **c46**

Richard H. Rapp *In its* Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 267-272 refs (For primary document see N79-21460 12-42)

(Grants NGR-36-008-161; NsG-5275)

Avail: NTIS HC A16/MF A01 CSCL 08N

Satellite derived potential coefficients (GEM 9) are compared to terrestrial gravity data by degree in terms of coefficient differences and in terms of mean anomaly differences. The root mean square undulation difference (to degree 20) was 9 + or - m and the anomaly difference was + or - 7 mgals with GEM 9 commission errors of + or - 1.7 m and + or - 3.8 mgals. The standard deviations of the GEM 9 implied undulations increased from + or - 4 cm at degree 2 to + or - 53 cm at degree 20. The corresponding values implied by a recent (June 1978) terrestrial 5 deg field were + or - 2.53 m and + or - 0.38 m (at degree 20). Comparisons between Geos-3 altimeter derived anomalies and 1 deg X 1 Deg terrestrial data showed that + or - 6-8 mgals is a reasonable accuracy estimate for the altimeter derived anomalies. Anomalies derived from satellite to satellite tracking data indicate an accuracy of about + or - 6 mgals for the recovery of 5 deg equal area blocks.

A.R.H.

N79-21500*# New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.

ACCURACY OF VERTICAL DEFLECTION DETERMINATION BY PRESENT-DAY INERTIAL INSTRUMENTATION **c43**

K. P. Schwarz *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 273-281 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08B

An analysis of results obtained in the Canadian Rock Mountains indicates that the observation of deflection differences along the same line can be repeated with a precision of about 0.5 sec but that there are systematic discrepancies between the forward and the backward running of the same line. A comparison with the available astronomically determined deflections also shows systematic differences of 2 sec and 3 sec. These errors are most likely due to the overshooting of the Kalman procedure at gradient changes. It appears that the software can be altered in such a way that deflection differences between stations, not more than half an hour of travel time apart, can be determined by the inertial system with an accuracy of better than + or - 1 sec. A.R.H.

N79-21501*# Colorado Univ., Boulder. Dept. of Geological Sciences.

IMPLICATIONS OF CAVITY, TOPOGRAPHIC AND GEOLOGIC INFLUENCES ON TILT AND STRAIN OBSERVATIONS **c48**

J. C. Harrison *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 283-287 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08C

Tilt and strain observations are importantly (pathologically at the 100%, typically at the few 10s% level) affected by cavities, topography, and geological inhomogenities; gravity observation are practically unaffected. The traditional earth tide observatory and abandoned mine or tunnel is a very poor place to measure body tides because of the complicated cavities, topography and geology. Instead, the ideal site for observing the body tide is in flat terrain with horizontally layered, mechanically homogeneous geology. Strain will be measured with long surface- or trench-mounted laser strain meters and tilt with long, surface- or trench mounted liquid levels, or with borehole tiltmeters. Horizontal geological discontinuities can produce large perturbations of the tilt and strain tides, and these perturbations, using the known homogeneous tidal strains and tilts, can be used in exploring local structure in favorable cases and, through possible time variations of tidal admittances, in predicting earthquakes. A.R.H.

N79-21502*# National Oceanic and Atmospheric Administration, Seattle, Wash. National Marine Environmental Lab.

OPEN OCEAN TIDE MODELLING **c48**

Michael E. Parke *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 289-297 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08C

Two trends evident in global tidal modelling since the first GEOP conference in 1972 are described. The first centers on the incorporation of terms for ocean loading and gravitational self attraction into Laplace's tidal equations. The second centers on a better understanding of the problem of near resonant modelling and the need for realistic maps of tidal elevation for use by geodesists and geophysicists. Although new models still show significant differences, especially in the South Atlantic, there are significant similarities in many of the world's oceans. This allows suggestions to be made for future locations for bottom pressure gauge measurements. Where available, estimates of M2 tidal dissipation from the new models are significantly lower than estimates from previous models. A.R.H.

N79-21503*# Institute of Oceanographic Sciences, Birkenhead (England).

WHAT CAN EARTH TIDE MEASUREMENTS TELL US ABOUT OCEAN TIDES OR EARTH STRUCTURE? **c48**

T. F. Baker *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 299-307 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08C

Current experimental problems in Earth tides are reviewed using comparisons of tidal gravity and tilt measurements in Europe with loading calculations are examples. The limitations of present day instrumentation and installation techniques are shown as well as some of the ways in which they can be improved. Many of the geophysical and oceanographic investigations that are possible with Earth tide measurements are discussed with emphasis on the percentage accuracies required in the measurements in order to obtain new information about Earth or its oceans. A.R.H.

N79-21504*# California Univ., San Diego. Dept. of Physics.

HIGH PRECISION TIDE SPECTROSCOPY **c48**

John M. Goodkind *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 309-311 refs (For primary document see N79-21460 12-42)

(Grants NGR-05-009-246; NSF EAR-75-21621; NBS-5-9013; Contracts DI-14-08-0001-G-297; DI-14-08-0001-G-374)

Avail: NTIS HC A16/MF A01 CSCL 08C

Diurnal and long period earth tides were measured to high accuracy and precision with the superconducting gravimeter. The results provide new evidence on the geophysical questions which have been attacked through earth tide measurements in the past. In addition, they raise new questions of potential interest. Slow fluctuations in gravity of order 10 micron gal over periods of 3 to 5 months were observed and are discussed. Author

N79-21505*# Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.

LINEAR AND NONLINEAR INTERACTIONS BETWEEN THE EARTH TIDE AND A TECTONICALLY STRESSED EARTH **c46**

Christopher Beaumont *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Sump. 1978 p 313-318 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08G

In the vincinity of earthquake focal regions, conditions may not be equal. Crustal rocks stressed to more than approximately 0.6 of their failure strength exhibit material properties over and above that of linear elasticity. Interactions between the earth tide and crustal rocks that are under high tectonic stress are discussed in terms of simple phenomenological models. In particular, the difference between a nonlinear elastic model of dilatancy and a dilatancy model that exhibits hysteresis is noted. It is concluded that the small changes in stress produced by the earth tide act as a probe of the properties of crustal rocks. Observations of earth tide tilts and strains in such high stress zones may, therefore, provide keys to the constitutive properties and the tectonic stress rate tensor of these zones. A.R.H.

N79-21506*# Lamont-Doherty Geological Observatory, Palisades, N. Y.

THE INVERSE PROBLEM: OCEAN TIDES DERIVED FROM EARTH TIDE OBSERVATIONS **c48**

John T. Kuo *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 319-326 refs (For primary document see N79-21460 12-42)

(Contract ONR-TO-0605; Grant NSF EAR-76-24383)

Avail: NTIS HC A16/MF A01 CSCL 08C

Indirect mapping ocean tides by means of land and island-based tidal gravity measurements is presented. The inverse scheme of linear programming is used for indirect mapping of ocean tides. Open ocean tides were measured by the numerical integration of Laplace's tidal equations. S.E.S.

N79-21507*# Kiel Univ. (West Germany). Inst. of Geophysics.

TIDAL FRICTION IN THE SOLID EARTH **c48**

Jochen Zschau *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern Symp. 1978 p 327-330 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08C

The earth's imperfectly elastic response to body and loading tidal forces is discussed using complex Love numbers and complex mass loading coefficients. Exact analytical expressions were derived relating the energy dissipation within an inhomogeneous, compressible solid earth to the surface values of these complex characteristic numbers, thus relating the global dissipation function Q to the phase shifts in the potential, gravity, tilt, strain and displacement tides. Integration of a global ocean tidal model shows that energy dissipated in the solid earth due to ocean loading is at least 10% of that dissipated in the body tides. S.E.S.

N79-21508*# Cooperative Inst. for Research in Environmental Science, Boulder, Colo.

BODY TIDES ON AN ELLIPTICAL ROTATING EARTH **c48**

John M. Wahr *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 331-336 refs (For primary document see N79-21460 12-42)

(Grant NsG-7319)

Avail: NTIS HC A16/MF A01 CSCL 08C

The complete tidal response of an elliptical, rotating, elastic Earth is found to contain small displacements which do not fit into the conventional Love number framework. Corresponding observable tidal quantities (gravity, tilt, strain, Eulerian potential, etc.) are modified by the addition of small latitude dependent terms. Author

N79-21509*# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.

OBSERVATION OF THE NEARLY DIURNAL RESONANCE OF THE EARTH USING A LASER STRAINMETER **c46**

Judah Levine *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 333-336 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08E

The response of the Earth to the diurnal and semidiurnal tidal excitations was studied. Results show that there is significant structure in the response of the earth to tidal excitations near one cycle/sidereal day. This structure agrees with the resonance behavior predicted from the calculations of the forced elasticgravitational response of an elliptical, rotating earth with a liquid outer core. The data is used to test for possible preferred frames and spatial anisotropies. Upper bounds on the parameterized post-Newtonian (PPN) parameters were examined. S.E.S.

N79-21510*# Lisbon Univ. (Portugal). Dept. of Applied Mathematics.

THE INFLUENCE OF EARTH TIDES ON EARTH'S COORDINATES **c43**

R. O. Vincente *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 337-339 refs (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 08B

The importance of the Earth's tides on Earth coordinates were examined for the following reasons: (1) the precision for obtaining the Earth's coordinates shows that the effects of Earth tides appear on the values obtained for the coordinates; (2) the possibility of determining the values of the Earth tides; and (3) the consideration of theoretical mocels that can compute the values of Earth tides. The astronomical and geodetic coordinates of a point at the Earth's surface are described. S.E.S.

N79-21511*# Cooperative Inst. for Research in Environmental Science, Boulder, Colo.

HOW DO EARTH TIDES AFFECT ASTRONOMERS? **c89**

Tetsuo Sasao *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 341-343 (For primary document see N79-21460 12-42)

Avail: NTIS HC A16/MF A01 CSCL 03A

Earth tides affect astronomical observations of the Earth's rotation in the following two ways: (1) verticals are deflected; and (2) the polar moment of inertia of the Earth is changed causing periodic variations in the rotation rate. The diurnal and semidiurnal tides and nutation were examined in periodic variations. Results indicate little change occured in the polar motions. Nutation observations were disturbed rather seriously by the diurnal tides. S.E.S.

N79-21512*# California Univ., Los Angeles. Dept. of Earth and Space Sciences.

GEODYNAMIC PROBLEMS **c43**

W. M. Kaula *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 345-351 refs (For primary document see N79-21460 12-42)

(Grant NsG-5263)

Avail: NTIS HC A16/MF A01 CSCL 08E

The understanding of the solid earth and suggestions of what measurements should be undertaken based on estimates of instrumental feasibilities were reviewed. The observations include: (1) earth evolution and mantle convection; (2) lithosphere-asthenosphere-surface load interaction; (3) glacier-ocean-solid earth interaction; (4) solid earth interactions with the sun, moon, core, oceans, and atmosphere; (5) zones of strain accumulation; and (6) earthquakes. S.E.S.

N79-21513# National Oceanic and Atmospheric Administration, Boulder, Colo.

GEODYNAMICS INTERNATIONAL - 13

Nov. 1978 63 p refs

(PB-291760/7; NOAA-78121403) Avail: NTIS HC A04/MF A01 CSCL 08G

An international program of research on the dynamics and

dynamic history of the earth with the emphasis on deep-seated foundations of geological phenomena is described. Commission activities, working group activities, scientific symposia, and national committee reports are summarized. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N79-21514 Columbia Univ., New York.
AN INVESTIGATION OF SEDIMENTARY PROCESSES IN LAKES Ph.D. Thesis
George William Kipphut 1978 194 p
Avail: Univ. Microfilms Order No. 7908611

The application of radiochemical methods to the study of rates of certain sedimentary processes in lakes are investigated. Both naturally occurring and man-introduced radionuclides were used. Information was obtained concerning rates of sediment accumulation, rates and extents of sediment mixing, and rates of trace metal fluxes into the sediments of small lakes. Radionuclide profiles were determined from sediment cores collected in nine lakes. Pb profiles were used to estimate recent (0 - 150 years) rates of sedimentation. As oceanographic examples, the effects of mixing on C dating and stratigraphic correlation were discussed. A rather simple sediment mixing model for lakes is presented in which the ratio of the mixing depth to the sedimentation rate is related to the ability of sediments to act as 'buffers' retarding the rates at which lake systems can respond to changes in external chemical loading. The results of a series of trace metal experiments are summarized.
Dissert. Abstr.

N79-21515 California Univ., Los Angeles.
THE GEOGRAPHY OF FIRE AND CONIFER FORESTS IN THE EASTERN TRANSVERSE RANGES, CALIFORNIA Ph.D. Thesis
Richard Alan Minnich 1978 430 p
Avail: Univ. Microfilms Order No. 7907701

Because summer drought is a climatic norm in southern California, wildland fire has long had an important relationship to montane vegetation. The study evaluates aerial photography taken in 1938 and 1975 the vegetation and fire history of approximately 120,000 hectares of conifer forest in the eastern Transverse Ranges (east San Gabriel Mountains and San Bernardino Mountains), and includes analysis of fire history, fire weather, the impact of fire on plant communities, post-fire vegetation recovery, vegetation change, and early accounts of vegetation and burning prior to the institution of fire suppression practices at the turn of the century. Dissert. Abstr.

N79-21516 Ohio State Univ., Columbus.
THE GROUND WATER: SURFACE WATER INTERFACE IN OHIO Ph.D. Thesis
Roger John Henning 1978 543 p
Avail: Univ. Microfilms Order No. 7908157

On a regional basis, using a variety of techniques, the ground water - surface water interface of Ohio can be qualitatively and quantitatively examined. Computer programs were developed to automatically separate stream hydrographs into ground - water runoff and surface-water runoff, graphically produce flow-duration curves, quality-duration curves, quality-ratio curves, and hydrographs, as well as print-out summary statistics and data tables.
Dissert. Abstr.

N79-21517*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
MULTISPECTRAL SCANNER SYSTEM PARAMETER STUDY AND ANALYSIS SOFTWARE SYSTEM DESCRIPTION, VOLUME 2 Final Report, 1 Dec. 1977 - 30 Nov. 1978
D. A. Landgrebe, Principal Investigator, B. G Mobasseri, D. J. Wiersma, E. R Wiswell, C. D. McGillem, and P. E. Anuta Nov. 1978 133 p refs EREP 5 Vol.
(Contract NAS9-15466)
(E79-10162; NASA-CR-160113; LARS-112678-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 09B

The author has identified the following significant results. The integration of the available methods provided the analyst with the unified scanner analysis package (USAP), the flexibility and versatility of which was superior to many previous integrated techniques. The USAP consisted of three main subsystems; (1) a spatial path, (2) a spectral path, and (3) a set of analytic classification accuracy estimators which evaluated the system performance. The spatial path consisted of satellite and/or aircraft data, data correlation analyzer, scanner IFOV, and random noise model. The output of the spatial path was fed into the analytic classification and accuracy predictor. The spectral path consisted of laboratory and/or field spectral data, EXOSYS data retrieval, optimum spectral function calculation, data transformation, and statistics calculation. The output of the spectral path was fended into the stratified posterior performance estimator.

N79-21518*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
PROCESSING TECHNIQUES DEVELOPMENT, VOLUME 3 Final Report, 1 Dec. 1977 - 30 Nov. 1978
D. A. Landgrebe, Principal Investigator, P. E. Anuta, M. M. Hixson, and P. H. Swain Nov. 1978 177 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP 5 Vol.
(Contract NAS9-15466)
(E79-10163; NASA-CR-160094; LARS-112778-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 05B

The author has identified the following significant results. Analysis of the geometric characteristics of the aircraft synthetic aperture radar (SAR) relative to LANDSAT indicated that relatively low order polynominals would model the distortions to subpixel accuracy to bring SAR into registration for good quality imagery. Also the area analyzed was small, about 10 miles square, so this is an additional constraint. For the Air Force/ERIM data, none of the tested methods could achieve subpixel accuracy. Reasons for this is unknown; however, the noisy (high scintillation) nature of the data and attendent unrecognizability of features contribute to this error. It is concluded that the quadratic model would adequately provide distortion modeling for small areas, i.e., 10 to 20 miles square.

N79-21519*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
ASSESSMENT OF METHODS OF ACQUIRING ANALYZING, AND REPORTING CROP PRODUCTION STATISTICS, VOLUME 4 Final Report, 1 Dec. 1977 - 30 Nov. 1978
D. A. Landgrebe, Principal Investigator, M. F. Baumgardner, V. L. Anderson, C. C. Stellon, L. M. Nash, and K. S. Pillai Nov. 1978 101 p refs EREP 5 Vol.
(Contract NAS9-15466)
(E79-10164; NASA-CR-160093; LARS-112878-Vol-4) Avail: NTIS HC A06/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-21520*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
COMPUTER PROCESSING SUPPORT, VOLUME 5 Final Report, 1 Dec. 1977 - 30 Nov. 1978
D. A. Landgrebe, Principal Investigator and James L. Kast Nov. 1978 157 p EREP 5 Vol.
(Contract NAS9-15466)
(E79-10165; NASA-CR-160092; LARS-112978-Vol-5) Avail: NTIS HC A08/MF A01 CSCL 09B

There are no author-identified significant results in this report.

N79-21521*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
[REMOTE SENSING RESEARCH STUDIES] Final Technical Summary Report, 1 Dec. 1977 - 30 Nov. 1978
D. A. Landgrebe, Principal Investigator Nov. 1978 93 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP 5 Vol.
(Contract NAS9-15466)

(E79-10166; NASA-CR-160114; LARS-113078) Avail: NTIS HC A05/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-21522*# Old Dominion Univ. Research Foundation, Norfolk, Va.

INTERPRETATION OF THE CHARACTERISTICS OF OCEAN-DUMPED SEWAGE SLUDGE RELATED TO REMOTE SENSING Final Report, 18 Jul. 1977 - 17 Feb. 1979

Philips S. Pagoria and Chin Y. Kuo Apr. 1979 94 p refs

(Grant NsG-1441)

(NASA-CR-158454) Avail: NTIS HC A05/MF A01 CSCL 13B

Wastewater sludge characteristics in general, and characteristics of wastewater sludges generated by the City of Philadelphia in particular, were addressed. The types and sources of wastewater sludges, a description of sludge treatment and disposal processes, examination of sludge generation and management for the City of Philadelphia, and definition of characteristics for typical east coast sludges undergoing ocean disposal were discussed. Specific differences exist between the characteristics of primary and secondary wastewater sludges, especially with the nature and size distribution of the solids particles. The sludges from the City of Philadelphia monitored during remote sensing experiments were mixtures of various sludge types and lacked distinguishing characteristics. In particular, the anaerobic digestion process exerted the most significant influence on sludge characteristics for the City of Philadelphia. The sludges generated by the City of Philadelphia were found to be typical and harbor no unique features. Author

N79-21523# GeoEnergy Corp., Las Vegas, Nev.

AN ASSESSMENT OF SUBSURFACE SALT WATER DISPOSAL EXPERIENCE ON THE TEXAS AND LOUISIANA GULF COAST FOR APPLICATION TO DISPOSAL OF SALT WATER FROM GEOPRESSURED GEOTHERMAL WELLS

C. F. Knutson and C. R. Boardman 4 Aug. 1978 78 p refs

(Contract EY-77-C-08-1531)

(NVO/1531-2) Avail: NTIS HC A05/MF A01

The primary problems with respect to salt water disposal in the Gulf Coast area in general were determined from literature and current experience. High rate salt water disposal well data obtained for 8 specific counties in Texas and 10 parishes in Louisiana. Salt water disposal data and operating experience information were obtained from major gas and oil companies operating in the areas of interest, from DOE's strategic petroleum reserve program, and from an industrial waste engineering firm based in Houston. A prognosis is provided for the subsurface disposal of salt water at rates equal to or greater than approximately 3,000 bbls/day or 1,000,000 bbls/yr per well. Gulf Coast geology is reviewed and the mechanical, chemical, environmental, and legal aspects of salt water disposal are examined. A.R.H.

N79-21524# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

DESTRIPING SATELLITE IMAGES

B. K. P. Horn and R. J. Woodham Mar. 1978 32 p refs

(Contract N00014-75-C-0643)

(AD-A062263; AI-M-467) Avail: NTIS HC A03/MF A01 CSCL 14/5

Before satellite images obtained with multiple image sensors can be used in image analysis, corrections must be introduced for the differences in transfer functions of these sensors. Methods are here presented for obtaining the required information directly from the statistics of the sensor outputs. The assumption is made that the probability distribution of the scene radiance seen by each image sensor is the same. Successful destriping of LANDSAT images is demonstrated. Author (GRA)

N79-21525# Raytheon Co., Wayland, Mass. Equipment Div.

TOTAL SYSTEM ACCURACY FOR APPS (THE ANALYTICAL PHOTOGRAMMETRIC POSITIONING SYSTEM) Final Report, 10 Jun. 1974 - 9 Jun. 1975

E. Sewell, A. Harabedian (Human Factors Research, Inc., Los Angeles), and T. Jeffrey (Army Res. Inst., Ft. Belvoir, Va.) Oct. 1978 68 p

(Contract DAHC19-74-C-0063)

(AD-A063595; FR75-1516; ARI-TP-348) Avail: NTIS HC A04/MF A01 CSCL 05/8

The accuracy and speed with which experienced APPS operators can obtain UTM coordinates and the elevation above the datum plane for points of interest designated on various reconnaissance imagery types were determined. These points of interest were transferred by an analytical method from representative operational imagery--panoramic photography, infrared, and radar--to 1:100,000 scale data base photography and their UTM coordinates and elevation above the datum plane determined. Results were compared with known values and error magnitudes and performance time requirements obtained. Results indicate that experienced APPS operators are very consistent in their placement of points of interest under the reference dot (monocular pointing). The median variability error was 1.6 meters in the XY-plane. Time required per point for monocular pointing was about .18 minutes. GRA

N79-21526# Environmental Research Inst. of Michigan, Ann Arbor.

REMOTE SENSING INVESTIGATION FOR BEACH RECONNAISSANCE. BEACH SAND ENVIRONMENT TASK Final Report, 1 Jan. 1974 - 28 Feb. 1978

Carl F. Davis, Robert A. Shuchman, and Gwynn Suits Aug. 1978 47 p refs

(Contract N00014-74-C-0273)

(AD-A063307; ERIM-108900-12-F) Avail: NTIS HC A03/MF A01 CSCL 08/6

A review of the Beach Sand Environment task to date is given together with a description of a new sand reflectance model, AQUASAND. The AQUASAND model is a modification of the Suits radiative transfer canopy directional reflectance model. The model is used to generate artificial sand reflectance spectra whose parameters are user controlled. The spectra are subsequently used to develop an algorithm to predict mineralogy, moisture, and grain size of sands from input reflectance spectra. The problem of correct model input related to iron-staining of sand grains is addressed and solved. Using the proper iron-staining input the model is verified on 7 diverse beach types with varying moisture contents. The preliminary development and evaluation of a mineralogy, moisture and grain size algorithm is reported. A multistage regression framework appears to be the most productive type of algorithm. Author (GRA)

N79-21527# Alaska Univ., Fairbanks. Inst. of Water Resources.

HYDROLOGIC INTERPRETATION OF BASIN MORPHOLOGY

John D. Fox Aug. 1978 20 p refs

(Contract DI-14-34-0001-5002)

(PB-289368/3; IWR-95; W79-01899; OWRT-A-049-ALAS(1)) Avail: NTIS HC A02/MF A01 CSCL 08H

Methods of quantitative geomorphology were reviewed with emphasis on hillslope profile and channel network analyses. Parameters useful in relating basin form to hydrologic processes were identified and incorporated into an hydrologic model of small, upland watersheds. Sensitivity of streamflow to these parameters was investigated and recommendations for coupling form and function in watershed model design were made. GRA

N79-21528# Hydroscience Associates, Inc., Westwood, N. J.

GREAT LAKES ENVIRONMENTAL PLANNING USING LIMNOLOGICAL SYSTEMS ANALYSIS: MODEL SPECIFICATIONS Final Report

Jan. 1979 50 p refs Sponsored in part by EPA Prepared for Great Lakes Basin Commission, Ann Arbor, Mich.

(Contract DACW35-71-C-0030)

(PB-290153/6; EPA-600/3-79-011C) Avail: NTIS HC A03/MF A01 CSCL 08H

The deliberate decision making process used by the Great Lakes Basin Commission are documented. The technical and economical feasibility of developing mathematical models to assist in making selections from among alternative management strategies and structural solutions proposed for solving water resource problems of the Great Lakes were assessed. Present and future water resources problems, presently available data, problem-oriented mathematical models and the state of models

and model synthesis for large lakes were reviewed. A demonstration modeling framework for planning is developed and applied to western Lake Erie and the Great Lakes system. The four widely ranging alternatives for future modeling effects in the Great Lakes and recommends the modeling level most feasible to answer planning questions on scales ranging from the Great Lakes to regional areas. A proposed Commission study which will apply limnological systems analysis to the planning process is proposed. S.E.S.

N79-21529# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
TEMPERATURE AND DISSOLVED OXYGEN DATA FOR LAKE ONTARIO, 1972 (IFYGL)
Janice Dinegar Boyd and Brian J. Eadie Aug. 1978 219 p refs
(PB-291864/7; NOAA-TM-ERL-GLERL-21; GLERL-Contrib-158; NOAA-78122201) Avail: NTIS HC A10/MF A01 CSCL 08H

Continuous dissolved oxygen profiles taken in Lake Ontario in 1972 (IFYGL) were edited, corrected, and averaged over 2 m intervals and over up and down traces to give temperature, dissolved oxygen, and oxygen percent saturation profiles at up to 27 discrete depths. For each cruise a statistical summary of the three variables is presented, and tables of the actual values are given for each available cruise and station combination. GRA

N79-21530# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
MICROCRACK TECHNOLOGY FOR GEOTHERMAL EXPLORATION AND ASSESSMENT Final Report, 1 Mar. 1976 - 31 Aug. 1978
Gene Simmons 31 Aug. 1978 297 p refs
(Grants NSF AER-75-09588; NSF DAR-75-09588-A01)
(PB-290173/4; NSF/RA-780302) Avail: NTIS HC A13/MF A01 CSCL 08I

Repeated fracturing and fracture sealing wwere observed in core samples from six geothermal areas. Both fracture porosity and morphology vary widely. The minerals that seal fractures show significant temporal variations. Water-rock reactions and alteration often produce low density or hydrous phases that further seal and block cracks. Such parameters as hydraulic permeability and electrical conductivity that influence the geologic environment or serve as geothermal indicators are dependent on the fracture state of the rock. The microfractures from these geothermal areas have several distinctive characteristics which are explained. The microfractures in geothermal rocks reflect the dynamics of the geothermal system. The results of this investigation are applicable to several problems encountered in the exploration for geothermal areas and evaluation of the reservoir: (1) locating the geothermal areas; (2) interpretation of electrical surveys; and (3) prediction of reservoir characteristics and reservoir behavior during exploration. GRA

N79-21531# Colorado State Univ., Fort Collins. Water Resources Research Inst.
DEVELOPMENT OF A STREAM-AQUIFER MODEL SUITED FOR MANAGEMENT
Hubert J. Morel-Seytoux Aug. 1978 44 p refs
(Contract DI-14-34-0001-8006)
(PB-290343/3; W79-02450; OWRT-A-033-COLO(1)) Avail: NTIS HC A03/MF A01 CSCL 13B

In most available computer models of stream-aquifer interaction the river stages are treated as boundary conditions. However, in reality for low flow conditions, the problem is the predictor of the river stages. In management it is essential to have explicit relations between the decision variables such as pumping rates or upstream flow releases and the resulting states of the system such as downstream river flows and aquifier drawdowns. The discrete kernel approach for an isolated aquifer is combined with the discrete kernel approach for an isolated river (treated as a cascade of Muskingum reaches) so it was possible to derive the discrete kernels (influence coefficients) for all the states of interest as responses to all the relevant decision variables. The developed tool is suited for management due to the explicit nature of the relations which makes it possible to formulate the management (optimization) problem as a Mathematical Programming problem for which efficient solution algorithms exist. GRA

N79-21532# Environmental Monitoring and Support Lab., Las Vegas, Nev.
PROCEEDINGS OF WORKSHOP ON AUTOMATED IN SITU WATER QUALITY SENSOR
Donald T. Wruble, comp., John D. Koutsandreas, comp., and Barbara Pijanowski, comp. (NOAA, Washington, D.C.) 1978 268 p refs Workshop held at Las Vegas, Nev., 14-16 Feb. 1978 Sponsored in part by NOAA and Interagency Working Group on Satellite Data Collection Systems
(PB-290330/0; EPA-600/9-78-034) Avail: NTIS HC A12/MF A01 CSCL 14B

The lack of adequate automated in situ devices for meeting national water quality measurement needs, and possible solutions to the problem are considered. Agency programs and academic research programs are described. Sensor needs and technological areas that might be applied to sensor development, including electrochemical, automated wet chemistry, optical, and electrophysical sensors are covered. Recommendations for greater development emphasis, greater coordination within lead-agency responsibilities, and technology emphasis are presented. GRA

N79-21533# Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
FIELD ESTIMATES OF AQUATIC PLANT RESPIRATION AND ITS APPLICATION TO STEAM DISSOLVED OXYGEN BUDGETS
Archie J. McDonnell Dec. 1978 42 p refs
(Contract DI-14-31-0001-3123)
(PB-291333/3; W79-02816; OWRT-B-026-PA(1)) Avail: NTIS HC A03/MF A01 CSCL 06F

Daily measurements of dissolved oxygen variations were made throughout a calendar year on three separate segments of a stream subjected to aquatic plant growth. Mass balance budgets, quantifying respective sources and sinks of dissolved oxygen for the study segments, demonstrated the validity of incorporating an aquatic plant respiration pattern which varied in direct proportion to dissolved oxygen concentration. The effects of oxygen consumption by the plant population on field estimates of reaeration, daily gross primary productivity, community respiration and maximum net primary productivity in the budgeting process are evaluated. GRA

N79-21534# Geological Survey, Miami, Fla. Water Resources Div.
BISCAYNE AQUIFER, SOUTHEAST FLORIDA
H. Klein and J. E. Hull Sep. 1978 60 p refs Prepared in cooperation with EPA, Washington, D. C.
(PB-291250/9; USGS/WRD/WRI-79/003; USGS/WRI-78/107) Avail: NTIS HC A04/MF A01 CSCL 13B

Peak daily pumpage from the highly permeable, unconfined Biscayne aquifer for public water-supply systems in southeast Florida in 1975 was about 500 million gallons. Another 165 million gallons was withdrawn daily for irrigation. Recharge to the acquifer is primarily by local rainfall. Discharge is by evapotranspiration, canal drainage, coastal seepage, and pumping. Pollutants can enter the aquifer by direct infiltration from land surface or controlled canals, septic-tank and other drainfields, drainage wells, and solid-waste dumps. Dilution, dispersion, and absorption tend to reduce the concentrations. Seasonal heavy rainfall and canal discharge accelerate ground-water circulation, thereby tending to dilute and flush upper zones of the aquifer. The ultimate fate of pollutants in the aquifier is the ocean, although some may be adsorbed by the aquifer materials en route to the ocean, and some are diverted to pumping wells. GRA

N79-21535# Michigan Univ., Ann Arbor. Div. of Biological Sciences.
SEICHE STRUCTURE AND VERTICAL MIXING BELOW THE EPILIMNION IN SMALL LAKES Project Completion Report, 1 Oct. 1977 - 30 Sep. 1978
Peter Kilham, Julian P. Adams, and Bruce D. Lazerte 10 Dec. 1978 200 p refs
(Contract DI-14-34-0001-7048)
(PB-291400/0; W79-02813; OWRT-A-094-MICH(1)) Avail:

NTIS HC A10/MF A01 CSCL 13B

The internal seiche structure of Frains Lake, Michigan has several vertical modes during summer stratification. The lowest frequencies have the greatest amplitudes, down to 0.05 cycles per half-hour, with the higher frequencies becoming progressively less dominant. The fundamental vertical internal mode is imperceptible. The phase shifts with depth of the observed vertical harmonics correspond well with those predicted by a discrete approximation to the continuous density internal wave equations. In addition, seasonal shifts in frequency and phase displacement that follow the seasonal changes in the temperature profile were predicted and observed. Currents in the hypolimnion are primarily driven by internal seiches. The major conclusion is that hypolimnion region of small lakes can be turbulently mixed by currents primarily driven by internal seiches. This may be of use in the prediction and management of algal blooms. GRA

N79-21536# Nebraska Univ., Lincoln.
APPLICATION OF COMPUTER WAVEFORM MATCHING TO MONITORING OF HYDROLOGIC SYSTEM PARAMETERS
Chao-Hsing Pian Jul. 1977 121 p refs
(Contract DI-14-31-0001-5088)
(PB-291432/3; W79-02836; OWRT-B-031-NEB(1)) Avail: NTIS HC A06/MF A01 CSCL 08H

A waveform mapping approach to optimization of parameters in a stream flow simulator based on a distributed hydrologic system model was designed, described, and applied. Assuming initial values, the model parameters for the simulator are adjusted using information obtained from waveform-mapped comparisons of observed and predicted hydrographs. Optimization of the simulation parameters is performed by a two-dimensional transformation and regression technique which yields values of mapping parameters that provide the feedback information used for adjusting the model parameters. The algorithm was tested both independently and in conjunction with watershed streamflow simulator. The results of these tests indicate the success of the original waveform matching method designed for parameter optimization in streamflow simulators. GRA

N79-21500*# New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
ACCURACY OF VERTICAL DEFLECTION DETERMINATION BY PRESENT-DAY INERTIAL INSTRUMENTATION
K. P. Schwarz *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 273-281 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08B

N79-21510*# Lisbon Univ. (Portugal). Dept. of Applied Mathematics.
THE INFLUENCE OF EARTH TIDES ON EARTH'S COORDINATES
R. O. Vincente *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 337-339 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08B

N79-21512*# California Univ., Los Angeles. Dept. of Earth and Space Sciences.
GEODYNAMIC PROBLEMS
W. M. Kaula *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 345-351 refs (For primary document see N79-21460 12-42)
(Grant NsG-5263)
Avail: NTIS HC A16/MF A01 CSCL 08E

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N79-21537* National Aeronautics and Space Administration, Washington, D. C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 19
Oct. 1978 693 p
(NASA-SP-7043(19)) Avail: NTIS HC E07 CSCL 10B

A bibliographical list of 1339 reports, articles, and other documents introduced into the NASA scientific and technical information system from July 1, 1978 through September 30, 1978 are presented. G.Y.

N79-21538*# National Aeronautics and Space Administration, Washington, D. C.
SATELLITE POWER SYSTEM: CONCEPT DEVELOPMENT AND EVALUATION PROGRAM, REFERENCE SYSTEM REPORT
Jan. 1979 321 p refs Prepared in cooperation with DOE, Washington, D. C.
(NASA-TM-79762; DOE/ER-0023) Avail: NTIS HC A14/MF A01 CSCL 10B

The Satellite Power System (SPS) Reference System is discussed and the technical and operational information required in support of environmental, socioeconomic, and comparative assessment studies are emphasized. The reference System concept features a gallium-aluminum-arsenide, and silicon solar cell options. Other aspects of an SPS are the construction of bases in space, launch and mission control bases on earth, and fleets of various transportation vehicles to support the construction and maintenance operations of the satellites. M.M.M.

N79-21539* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR CELL MODULE ASSEMBLY JIG Patent
Herbert W. Farrell, inventor (to NASA) (TRW, Inc., Redondo Beach, Calif.) Issued 26 Jul. 1966 7 p Filed 10 Jun. 1963 Sponsored by NASA
(NASA-Case-XGS-00829-1; US-Patent-3,262,694; US-Patent-Appl-SN-286824; US-Patent-Class-269-153) Avail: US Patent and Trademark Office CSCL 10A

The invention relates to the manufacture of solar cell modules and more particularly to a jig for assembling, positioning and maintaining the components under resilient pressure, while the entire assembly and the jig is subjected to heat for simultaneously soldering all of the various circuit connections, as well as structurally bonding the layers into a strong light weight structure which minimizes the tendency of the solar cells to crack and the other components and electrical connections to fracture.

Official Gazette of the U.S. Patent and Trademark Office

N79-21540 Pennsylvania State Univ., University Park.
AN ANALYSIS OF SEMI-DIRECT ITERATIVE AND DIRECT SOLUTION TECHNIQUES: AN APPLICATION TO THE CYCLIC STEAM STIMULATION PROCESS Ph.D. Thesis
Keith Alva Burgess 1978 191 p
Avail: Univ. Microfilms Order No. 7909051

A solution scheme together with a completely simultaneous solution to the cyclic steam stimulation process is presented. The numerical model developed encompasses a two-dimensional radial geometry, heat transfer and three-phase fluid flow in a multilayer reservoir. Interphase mass transfer and solution gas effects are accounted for. The model is used for performance predictions for a wide range of variables. The model solves the mass and energy balance equations simultaneously for pressures, saturations and temperature. This approach permits efficient

solution of difficult situations, such as gas percolation in cycling steaming. Apart from that, two distinctly different approaches are employed: direct solution and semi-direct solution.
Dissert. Abstr.

N79-21541 South Carolina Univ., Columbia.
A STUDY OF THE EFFECTIVE RESISTANCE OF THE DIFFUSED LAYER AND ITS EFFECT ON SOLAR CELL PERFORMANCE Ph.D. Thesis
Yingsheng Tung 1978 123 p
Avail: Univ. Microfilms Order No. 7907638

The series resistance associated with the solar cell was proven to be a limiting factor on the conversion efficiency. The contribution from the diffused layer to the total series resistance is analyzed using a numerical method. It is found that the relationship between the current and the voltage in the diffused layer is nonlinear; consequently, the electrical behavior of this layer can not be described by a resistance of constant value. Another approach for synthesizing the solar cell design is proposed using unit fields as building blocks. Since the total power output from a cell can be derived from that of the constituent unit fields, the performance of the cell as a whole can be predicted once the current and voltage characteristics of the unit field are known. A procedure is described which enables one to accomplish this through the construction of the I-V curves of each unit field. Dissert. Abstr.

N79-21542 Maryland Univ., College Park.
ION-IMPLANTED SOLAR CELLS Ph.D. Thesis
Yet-Ping Pai 1978 123 p
Avail: Univ. Microfilms Order No. 7908859

An ion-implanted solar cell was made by implanting low energy arsenic ions to the surface of a p-type silicon substrate. The ion-implantation technique offers the advantages of a better dosage control, uniformity, and reproducibility over the conventional diffusion method. A solar cell thus formed can be either a Schottky barrier or a junction, depending on the implantation dosage. A general analysis for the ion-implanted solar cell, which in the extreme case can be applied to either the MIS Schottky cell or the pn junction cell is presented. This analysis was done either analytically by making some approximational transport or numerically by solving the one-dimensional transport equations with the best available structural and material parameters as input data. Experimental work has been done in supporting our analysis. Some of the important solar cell parameters were characterized. Dissert. Abstr.

N79-21543*# Agricultural and Technical Coll. of North Carolina, Greensboro. Department of Electrical Engineering.
MATERIAL GROWTH AND CHARACTERIZATION DIRECTED TOWARD IMPROVING III-V HETEROJUNCTION SOLAR CELLS Annual Report, 1 Feb. 1978 - 31 Jan. 1979
Elias K. Stefanakos, Winser E. Alexander, Ward Collis, and Ali Abul-Fadl 31 Jan. 1979 88 p refs
(Grant NsG-1390)
(NASA-CR-158476) Avail: NTIS HC A05/MF A01 CSCL 10A

In addition to the existing materials growth laboratory, the photolithographic facility and the device testing facility were completed. The majority of equipment for data acquisition, solar cell testing, materials growth and device characterization were received and are being put into operation. In the research part of the program, GaAs and GaAlAs layers were grown reproducibly on GaAs substrates. These grown layers were characterized as to surface morphology, thickness and thickness uniformity. The liquid phase epitaxial growth process was used to fabricate p-n junctions in Ga(1-x)Al(x)As. Sequential deposition of two alloy layers was accomplished and detailed analysis of the effect of substrate quality and dopant on the GaAlAs layer quality is presented. Finally, solar cell structures were formed by growing a thin p-GaAlAs layer upon an epitaxial n-GaAlAs layer. The energy gap corresponding to the long wavelength cutoff of the spectral response characteristic was 1.51-1.63 eV. Theoretical calculations of the spectral response were matched to the measured response. L.S.

N79-21544*# College of William and Mary, Williamsburg, Va.
NEW INFRARED DETECTORS AND SOLAR CELLS Final Report, 1 Feb. 1978 - 31 Jan. 1979
A. Sher 18 Apr. 1979 75 p refs
(Grant NSG-1385)
(NASA-CR-158477) Avail: NTIS HC A04/MF A01 CSCL 10A

The inventions and published papers related to the project are listed. The research with thin films of LaF3 deposited on GaAs substrates is reported along with improvements in photocapacitative MIS infrared detectors. F.O.S.

N79-21545*# Boeing Engineering and Construction, Seattle, Wash.
FEASIBILITY STUDY OF SOLAR DOME ENCAPSULATION OF PHOTOVOLTAIC ARRAYS Final Report
Dec. 1978 175 p refs Sponsored by NASA Prepared for DOE and JPL
(Contract JPL-954833)
(NASA-CR-158368; DOE/JPL-954833-78/1) Avail: NTIS HC A08/MF A01 CSCL 10A

The technical and economic advantages of using air-supported plastic enclosures to protect flat plate photovoltaic arrays are described. Conceptual designs for a fixed, latitude-tilt array and a fully tracking array were defined. Detailed wind loads and strength analyses were performed for the fixed array. Detailed thermal and power output analyses provided array performance for typical seasonal and extreme temperature conditions. Costs of each design as used in a 200 MWe central power station were defined from manufacturing and material cost estimates. The capital cost and cost of energy for the enclosed fixed-tilt array were lower than for the enclosed tracking array. The enclosed fixed-tilt array capital investment was 38% less, and the levelized bus bar energy cost was 26% less than costs for a conventional, glass-encapsulated array design. The predicted energy cost for the enclosed fixed array was 79 mills/kW-h for direct current delivered to the power conditioning units. L.P.

N79-21546*# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF AN ACCELERATED TEST DESIGN FOR PREDICTING THE SERVICE LIFE OF THE SOLAR ARRAY AT MEAD, NEBRASKA Quarterly Report
G. B. Gaines, R. E. Thomas, G. T. Noel, T. S. Shilliday, V. E. Wood, and D. C. Carmichael 6 Feb. 1979 51 p refs Prepared for JPL
(Contract JPL-954328)
(NASA-CR-158373; DOE/JPL-954328-79/11) Avail: NTIS HC A04/MF A01 CSCL 10A

Potential long-term degradation modes for the two types of modules in the Mead array were determined and judgments were made as to those environmental stresses and combinations of stresses which accelerate the degradation of the power output. Hierarchical trees representing the severity of effects of stresses (test conditions) on eleven individual degradation modes were constructed and were pruned of tests judged to be nonessential. Composites of those trees were developed so that there is now one pruned tree covering eight degradation modes, another covering two degradation modes, and a third covering one degradation mode. These three composite trees form the basis for selection of test conditions in the final test plan which is now being prepared. A.R.H.

N79-21547*# Rasor Associates, Inc., Sunnyvale, Calif.
POWER COUPLING ALTERNATIVES FOR THE NEP THERMIONIC POWER SYSTEM Final Report
M. L. Manda, E. J. Britt, and G. O. Fitzpatrick Dec. 1978 64 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955121)
(NASA-CR-158372; NSR-7-1) Avail: NTIS HC A04/MF A01

Three output power coupling methods which can eliminate the high temperature insulator from the Nuclear Electric Propulsion (NEP) power system are described and estimates of their effects on the NEP system masses and cooling requirements are presented. Nominal 400 kWe power systems using push-pull and flux reset inductive output coupling are shown to have specific masses of 22.2 kg/kWe and 18.8 kg/kWe, respectively. Series connected heat pipe systems, which use the heat pipe-to-heat pipe resistance to isolate converters on adjacent heat pipes, are shown to have specific masses 0.5 to 1.4 kg/kWe lower than the NEP baseline system. Increasing the number and temperature of the heat pipes in the system without changing the electric

output reduces the calculated system specific mass only slightly, whereas increasing the output power significantly reduces the specific mass. Estimates of cooling requirements indicate that 11-45 sq m of power conditioning radiator are needed. A possible location for the power conditioning radiator may be in the present location of the kapton sputter shield. M.M.M.

N79-21548*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THERMAL POWER SYSTEMS SMALL POWER SYSTEMS APPLICATIONS PROJECT. DECISION ANALYSIS FOR EVALUATING AND RANKING SMALL SOLAR THERMAL POWER SYSTEM TECHNOLOGIES. VOLUME 1: A BRIEF INTRODUCTION TO MULTIATTRIBUTE DECISION ANALYSIS
A. Feinberg and R. F. Miles, Jr. 1 Jun. 1978 30 p refs Prepared for DOE
(Contract NAS7-100)
(NASA-CR-158425; DOE/JPL-1060-15; JPL-Pub-79-12-Vol-1; Rept-5103-47-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 10A

The principal concepts of the Keeney and Raiffa approach to multiattribute decision analysis are described. Topics discussed include the concepts of decision alternatives, outcomes, objectives, attributes and their states, attribute utility functions, and the necessary independence properties for the attribute states to be aggregated into a numerical representation of the preferences of the decision maker for the outcomes and decision alternatives. L.P.

N79-21549*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF MOSTAS COMPUTER CODE FOR PREDICTING DYNAMIC LOADS IN TWO BLADED WIND TURBINES
K. R. V. Kaza (Toledo Univ.), D. C. Janetzke, and T. L. Sullivan 1979 21 p refs Presented at AIAA/ASCE/AHS 20th Structures, Structural Dynamics and Mater. Conf., St. Louis, Mo., 4-6 Apr. 1979
(Contract E(49-26)-1028)
(NASA-TM-79101; DOE/NASA/1028-72/2; E-9925) Avail: NTIS HC A02/MF A01 CSCL 10B

Calculated dynamic blade loads were compared with measured loads over a range of yaw stiffnesses of the DOE/NASA Mod-O wind turbine to evaluate the performance of two versions of the MOSTAS computer code. The first version uses a time-averaged coefficient approximation in conjunction with a multi-blade coordinate transformation for two bladed rotors to solve the equations of motion by standard eigenanalysis. The second version accounts for periodic coefficients while solving the equations by a time history integration. A hypothetical three-degree of freedom dynamic model was investigated. The exact equations of motion of this model were solved using the Floquet-Lipunov method. The equations with time-averaged coefficients were solved by standard eigenanalysis. L.P.

N79-21550*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE ROLE OF THERMAL ENERGY STORAGE IN INDUSTRIAL ENERGY CONSERVATION
Rudolph A. Duscha and William J. Masica 1979 13 p refs Presented at a Conf. on Ind. Energy Conserv. Technol. and Exhibition, Houston, Tex., 22-25 Apr. 1979; sponsored by DOE and the Texas Ind. Comm.
(Contract EC-77-A-31-1034)
(NASA-TM-79122; DOE/NASA/1034-79/1; E-9957) Avail: NTIS HC A02/MF A01 CSCL 10C

Thermal Energy Storage for Industrial Applications is a major thrust of the Department of Energy's Thermal Energy Storage Program. Utilizing Thermal Energy Storage (TES) with process or reject heat recovery systems is shown to be extremely beneficial for several applications. Recent system studies resulting from contracts awarded by the Department of Energy (DOE) identified four especially significant industries where TES appears attractive - food processing, paper and pulp, iron and steel, and cement. Potential annual fuel savings with large scale implementation of near term TES systems for these industries is over 9,000,000 bbl of oil. This savings is due to recuperation and storage in the food processing industry, direct fuel substitution in the paper and pulp industry and reduction in electric utility peak fuel use through inplant production of electricity from utilization of reject heat in the steel and cement industries. Author

N79-21551*# ECON, Inc., Princeton, N. J.
ASSESSMENT OF ECONOMIC FACTORS AFFECTING THE SATELLITE POWER SYSTEM. VOLUME 1: SYSTEM COST FACTORS Final Report
George A. Hazelrigg, Jr. 15 Dec. 1978 175 p refs
(Contract NAS8-33002)
(NASA-CR-161185; Econ-78-147-1) Avail: NTIS HC A08/MF A01 CSCL 10B

The factors relevant to SPS costing and selection of preferred SPS satellite configurations were studied. The issues discussed are: (1) consideration of economic factors in the SPS system that relate to selection of SPS satellite configuration; (2) analysis of the proper rate of interest for use in SPS system definition studies; and (3) the impacts of differential inflation on SPS system definition costing procedures. A cost-risk comparison of the SPS satellite configurations showed a significant difference in the levelized cost of power from them. It is concluded, that this difference is the result more of differences in the procedures for assessing costs rather than in the satellite technologies required or of any advantages of one satellite configuration over the other. Analysis of the proper rate of interest for use in SPS system is 4 percent. The major item of differential inflation to be expected over this period of time is the real cost of labor. This cost is likely to double between today and the period of SPS construction. M.M.M.

N79-21552*# Little (Arthur D.), Inc., Cambridge, Mass.
ASSESSMENT OF ECONOMIC FACTORS AFFECTING THE SATELLITE POWER SYSTEM. VOLUME 2: THE SYSTEMS IMPLICATIONS OF RECTENNA SITING ISSUES Final Report
Philip K. Chapman, Beverly J. Bugos, Katinka I. Csigi, Peter E. Glaser, Gerald R. Schimke, and Richard G. Thomas 8 Mar. 1979 66 p refs Prepared for ECON, Inc., Princeton, N. J.
(Contract NAS8-33002)
(NASA-CR-161186) Avail: NTIS HC A04/MF A01 CSCL 10B

The feasibility was evaluated of finding potential sites for Solar Power Satellite (SPS) receiving antennas (rectennas) in the continental United States, in sufficient numbers to permit the SPS to make a major contribution to U.S. generating facilities, and to give statistical validity to an assessment of the characteristics of such sites and their implications for the design of the SPS system. It is found that the cost-optimum power output of the SPS does not depend on the particular value assigned to the cost per unit area of a rectenna and its site, as long as it is independent of rectenna area. Many characteristics of the sites chosen affect the optimum design of the rectenna itself. Author

N79-21553*# National Aeronautics and Space Administration, Washington, D. C.
RESEARCH ON MEDIUM AND HIGH TEMPERATURE SOLAR HEAT STORAGE MATERIALS
D. Heine, J. Jucker, D. Koch, H. Krahling, and W. Supper Apr. 1979 64 p refs Transl. into ENGLISH of "Untersuchung von Mittel- und Hochtemperaturlatentwaermespeichermaterialen", Rept. IKE-52F-258-78 Inst. fuer Kerntech. und Energiewandlung e.v., Stuttgart, Jul. 1978 p 1-56 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75397; IKE-52F-258-78) Avail: NTIS HC A04/MF A01 CSCL 10A

Characteristics of solar heat storage materials, preliminary tests in which melting and solidification characteristics are tested, and service life and cycling tests are reported. Various aspects of corrosion are discussed as well as decision about ultimate selection of materials. A program for storage and evaluation of data is included. Author

N79-21554*# Honeywell, Inc., Minneapolis, Minn.
ACTIVE HEAT EXCHANGE SYSTEM DEVELOPMENT FOR LATENT HEAT THERMAL ENERGY STORAGE
R. T. LeFrois, G. R. Knowles, A. K. Mathur, and J. Budimir

Feb. 1979 122 p refs
(Contracts DEN-3-38; EC-77-A-31-1034)
(NASA-CR-159479; HI-78336; DOE/NASA/0038-79/1) Avail: NTIS HC A06/MF A01 CSCL 10A

Active heat exchange concepts for use with thermal energy storage systems in the temperature range of 250 C to 350 C, using the heat of fusion of molten salts for storing thermal energy are described. Salt mixtures that freeze and melt in appropriate ranges are identified and are evaluated for physico-chemical, economic, corrosive and safety characteristics. Eight active heat exchange concepts for heat transfer during solidification are conceived and conceptually designed for use with selected storage media. The concepts are analyzed for their scalability, maintenance, safety, technological development and costs. A model for estimating and scaling storage system costs is developed and is used for economic evaluation of salt mixtures and heat exchange concepts for a large scale application. The importance of comparing salts and heat exchange concepts on a total system cost basis, rather than the component cost basis alone, is pointed out. The heat exchange concepts were sized and compared for 6.5 MPa/281 C steam conditions and a 1000 MW(t) heat rate for six hours. A cost sensitivity analysis for other design conditions is also carried out. L.P.

N79-21555# California Univ., Berkeley. Lawrence Berkeley Lab.
A COMPUTERIZED REPORTING AND MONITORING SYSTEM FOR GEOTHERMAL ENERGY DEVELOPMENT
S. L. Phillips, M. Tavana, K. Leung, M. Steyer, W. A. Palen, and S. R. Schwartz Dec. 1978 62 p refs
(Contract W-7405-eng-48)
(LBL-8483) Avail: NTIS HC A04/MF A01

It is proposed that the on-going compilation and critical evaluation of data be expanded to include a computerized system for monitoring and reporting the development of geothermal resources from the discovery phase to power on-line. Data would be covered which is site-specific and therefore unique to the geothermal area. Computer printouts are to contain a listing of each geothermal site which will be classified according to the status of development for producing electrical power. The result of the work will consist of a report containing a description of the data at each site and recommendations for additional data needs in technological, economic, or institutional areas. The computerized system will allow for ease in updating and remote accessing by off-site users. Author

N79-21556# Westinghouse Research and Development Center, Pittsburgh, Pa.
THIN FILM BATTERY/FUEL CELL POWER GENERATING SYSTEM Final Report, Apr. 1976 - Apr. 1978
31 Mar. 1978 226 p refs
(Contract EY-76-C-03-1197)
(CONS/1197-9) Avail: NTIS HC A11/MF A01

A rare-earth chromite was identified and synthesized by RF-sputtering. It was tested for resistivity, thermal expansion and inertness in contact with yttria-stabilized zirconia, and was used as an interconnection material. Films of these interconnection materials were successfully deposited onto stabilized zirconia tubes by electrochemical vapor deposition. This technique was used to fabricate such films in building fuel cell stacks. Tin-doped indium oxide and antimony-dpoed tin oxide air electrode current collector materials were successfully chemically vapor deposited, as thin films, onto zirconia tubes. An in-house extrusion technology for porous calciastabilized zirconia tubes were developed and used to provide suitable support tubes for component combination samples, unit cell and cell stack sample preparation. L.P.

N79-21557# Battelle Pacific Northwest Labs., Richland, Wash.
DEVELOPMENT, CHARACTERIZATION AND EVALUATION OF MATERIALS FOR OPEN CYCLE MHD
J. Lambert Bates, D. D. Marchant, and J. L. Daniel Aug. 1978 44 p refs
(Contract EY-76-C-06-1830)
(PNL-2004-8) Avail: NTIS HC A03/MF A01

Progress in the development of high temperature ceramics for open cycle, coal-fired MHD power generators is reported. Emphasis is placed on electrode and insulator materials. Specific areas covered include: (1) electrochemical effects of alkali seed/coal slags on electrodes and insulators; (2) characterization of material from Westinghouse MHD proof tests; (3) thermal diffusivity/conductivity; (4) electrical conductivity of oxide insulators; and (5) materials development. J.M.S.

N79-21558# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
DEVELOPMENT, TESTING AND EVALUATION OF MHD MATERIALS AND COMPONENT DESIGNS Quarterly Report, Jan. - Mar. 1978
John W. Sadler, Jeff Bein, David L. Black, Raymond Calvo, Laurence H. Cadoff (Westinghouse Res. and Develop. Center), James A. Dilmore (Westinghouse Res. and Develop. Center), Gary E. Driesen, Alfred G. Eggers, Edsel W. Frantti, and Edgar L. Kochka May 1978 160 p refs
(Contract EX-76-C-01-2248)
(FE-2248-19) Avail: NTIS HC A08/MF A01

Electrodes were evaluated for both clean and coal fired environments. Electrochemical screening tests in simulated liquid slags, conducted to provide additional information on the chemistry, mechanisms, and kinetics of electrode/slag reactions are described. The U-O2 post-test materials characterization provided the basis for the selection of LaCrO3 - based electrode materials with compliant Ni-mesh attachments for the U-O2 phase 3 electrode walls. Materials developed and detail design activities in support of the U-O2 phase 3 module were continued, and U-O2 phase 3 electrode sub-assemblies were prepared. A.R.H.

N79-21559# Allied Chemical Corp., Idaho Falls, Idaho. Chemical Programs - Operations Office.
LIQUID-FLUIDIZED-BED HEAT EXCHANGER FLOW DISTRIBUTION MODELS
L. T. Cole and C. A. Allen Jan. 1979 20 p refs
(Contract EY-76-C-07-1540)
(ICP-1151) Avail: NTIS HC A02/MF A01

Liquid-fluidized-bed shell-and-tube heat exchangers for geothermal applications are considered. Sand fluidized by geothermal water on the shell side prevents scaling and increases heat transfer coefficients over conventional heat exchangers. Tests conducted on two instrumented fluidized-bed heat exchanger models, constructed primarily of plexiglass, which differ in tube bundle orientation are described. Plexiglass construction allowed visual observation of flow patterns. The vertical model proved to have more uniform flow distribution and higher heat transfer coefficients than the horizontal model. The horizontal heat exchanger experienced piling on top of the tubes and areas of poor fluidization existed in the bed. Geometric considerations show that a horizontal design is more conducive to large flow rates than a vertical design. New design concepts for both vertical and horizontal assemblies and recommendatand recommendations for further developmental work are presented. J.M.S.

N79-21560# Avco-Everett Research Lab., Mass.
ENGINEERING TEST FACILITY CONCEPTUAL DESIGN, PART 1 Final Report
Jun. 1978 561 p
(Contract EF-77-C-01-2614)
(FE-2614-2-Pt-1) Avail: NTIS HC A24/MF A01

The final document reporting material and information developed in the ETF (Engineering Test Facility) Conceptual Design Activity of the Department of Energy is presented. The specific ETF reference system design recommended in the previous preliminary ETF conceptual Design Document of December 1977 is reported. The major design goals of the EFT are: (1) to provide for demonstration of long duration of a complete combined MHD (magnetohydrodynamic)/steam power system of pilot scale with coal as the primary fuel source; (2) to provide for testing and evaluation of the overall system, subsystem and components performance, controls and interactions, and to identify and resolve critical problem areas; and (3) to provide design information and the necessary engineering base and confidence for subsequent commercialization of open cycle MHD power generation. G.Y.

N79-21561# Avco-Everett Research Lab., Mass.
ENGINEERING TEST FACILITY CONCEPTUAL DESIGN, PART 2 Final Report
Jun. 1978 486 p refs

(Contract EF-77-C-01-2614)
(FE-2614-2-Pt-2) Avail: NTIS HC A21/MF A01

Part 2 of a two part final document is presented and reports on materials and information developed in the ETF (Engineering test Facility) Design Activity of the Department of Energy. The ETF goals are to design, operate and evaluate a complete combined MHD (magnetohydrodynamic)/steam power system of pilot plant scale with coal as the primary fuel source. Part 2 discusses the steam plant, instrumentation and control, plant layout, maintenance and service, buildings and structures, and site and site development. G.Y.

N79-21562# Oak Ridge National Lab., Tenn.
TRANSPORTATION ENERGY CONSERVATION DATA BOOK, EDITION 3
D. B. Shonka, ed. Feb. 1979 555 p refs
(Contract W-7405-eng-26)
(ORNL-5493) Avail: NTIS HC A24/MF A01

All major modes of transportation are represented: highway, air, rail, marine, and pipeline. Various aspects of the transportation sector discussed: (1) modal characteristics, (2) current energy use, efficiency and conservation, (3) projections of modal energy use, (4) impact of government activities, (5) supply and cost of energy, and (6) general demographic and economic characteristics. More than 400 tables and figures show the following transportation stock and use statistics: number of vehicles, vehicle miles traveled, passenger-miles and freight ton-miles, fleet characteristics, household automobile ownership, size of mix of automobiles, vehicle travel characteristics, and commuting patterns. Energy characteristics presented include energy use by fuel source and transportation mode, energy intensity figures by mode, indirect energy use, production as a percent of consumption, imports as a percent of domestic production, energy prices from the wellhead to the retail outlet, and alternative fuels. A.R.H.

N79-21563# AiResearch Mfg. Co., Torrance, Calif.
WAYSIDE ENERGY STORAGE SUMMARY. VOLUME 1: SUMMARY Final Report, May 1977 - Jun. 1978
L. J. Lawson and L. M. Cook Feb. 1979 76 p refs 2 Vol.
(Contract DOT-TSC-1349-1)
(DOT-TSC-FRA-79-7-1-Vol-1; FRA/ORD-78-1-Vol-1) Avail: NTIS HC A05/MF A01

An in-depth application study was conducted to determine the practicality and viability of using large wayside flywheels to recuperate braking energy from freight trains on long downgrades. The study examined the route structures of nine U.S. railroads and identified various wayside energy storage system (WESS) configurations. The optimum means voltage ac catenary from either regenerative electric locomotives or modified dual-mode (diesel-electric/electric)locomotives. The application of WESS was analyzed for four specific routes of typical U.S. railroads. These routes and the annual returns on investment resulting from WESS deployment on existing railroads were as follows: Atchinson, Topeka, and Sant Fe (Los Angeles to Belen), 27.1 percent; Black Mesa and Lake Powell, 17.3 percent; Conrail (Pittsburgh to Harrisburg), 22.0 percent; Union Pacific (Los Angeles to Salt Lake City) 20.2 percent. L.S.

N79-21564# Brookhaven National Lab., Upton, N. Y. Economic Analysis Div.
THE BROOKHAVEN BUILDINGS ENERGY CONSERVATION OPTIMIZATION MODEL
Steven C. Carhart, Shirish S. Mulherkar, and Yasuko Sanborn Jan. 1978 85 p refs
(Contract EY-76-C-02-0016)
(BNL-50828) Avail: NTIS HC A05/MF A01

The Brookhaven Buildings Energy Conservation Optimization Model is a linear programming representation of energy use in buildings. Starting with engineering and economic data on cost and performance of energy technologies used in buildings, including both conversion devices (such as heat pumps) and structural improvements, the model constructs alternative flows for energy through the technologies to meet demands for space heating, air conditioning, thermal applications, and electric lighting and appliances. Alternative paths have different costs and efficiencies. Within constraints such as total demand for energy services, retirement of existing buildings, seasonal operation of certain devices, and others, the model calculates an optimal configuration of energy technologies in buildings. Author

N79-21565*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 1977 GODDARD SPACE FLIGHT CENTER BATTERY WORKSHOP
1977 579 p Workshop held at Greenbelt, Md., 15-17 Nov. 1977
(NASA-CP-2041) Avail: NTIS HC A25/MF A01 CSCL 10C

The papers presented were derived from transcripts taken at the Tenth Annual Battery Workshop held at the Goddard Space Flight Center, November 15-17, 1977. The Workshop was attended by manufacturers, users, and government representatives interested in the latest results of testing, analysis, and development of the sealed nickel cadmium cell system. The purpose of the Workshop was to share flight and test experience, stimulate discussion on problem areas, and to review the latest technology improvements. For individual titles, see N79-21566 through N79-21616.

N79-21566*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ITOS POWER SYSTEM DESIGN
A. F. Obenschain *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 7-13 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A brief description of the ITOS power systems is presented. The descriptions are from viewgraphs shown to the participants of the Workshop. A block diagram of ITOS power supply subsystem is presented along with graphs representing: ITOS voltage limit versus temperature; and battery charge-discharge current profiles over an orbit period. G.Y.

N79-21567*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATMOSPHERIC EXPLORER
A. F. Obenschain and Phil Brandt *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 15-23 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Atmospheric Explorer (AE) is a 1971 power system design, using the heritage of the ITOS system. The system design and its operation are discussed. Problems of charging and discharging the batteries and the effects of temperature on these operations are discussed. A block diagram of the power supply electronics and some graphs related to voltage and temperature for the AE battery design are presented. G.Y.

N79-21568*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NIMBUS AND LANDSAT
Dave A. Baer and Dan Wise *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 25-42 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The operation and systems design of a nickel cadmium battery system used on the Nimbus and LANDSAT satellites are discussed. Emphasis is placed on the charging-discharging operation of the battery system. G.Y.

N79-21569*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ORBITING SOLAR OBSERVATORY BATTERY AND POWER DESIGN
Floyd E. Ford and Stan Bober *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 43-54 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The OSO-1 represents a recent vintage satellite, or more recent design satellite. A summary of the battery design used on OSO-1 is presented. The temperature effects on voltage and charging-discharging of the battery system are discussed. G.Y.

N79-21570*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ORBITING ASTRONOMICAL OBSERVATORY BATTERY

AND POWER SYSTEM DESIGN
Floyd E. Ford *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 55-79 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The battery design of OAO-C (OAO-3) is given and consists of three-20 ampere hour 22 series connected cells in the battery. There are three batteries per spacecraft. The packaging configuration is described. The charging-discharging operations and the voltage potential of the battery system are discussed. Graphs are presented for the voltage limits (battery voltage versus temperature) and end of dark voltages (battery voltage versus ampere-hours discharged) of the battery system used on OAO-3. Data tables are also presented which give a summary of the battery performance and a comparison of OAO-3 with OAO A-2. G.Y.

N79-21571*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SYNCHRONOUS METEOROLOGICAL AND GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITES BATTERY AND POWER SYSTEM DESIGN
Dave A. Baer and Walter J. Schedler (Natl. Environ. Satellite Serv., Suitland, Md.) *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 69-79 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The battery was a three ampere hour nickel cadmium prismatic cell. The battery consists of 20 cells connected in series and there were two batteries per spacecraft. The battery operations (voltage and temperature) that the spacecraft sees during a normal operational day are discussed. G.Y.

N79-21572*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS TECHNOLOGY SATELLITES BATTERY AND POWER SYSTEM DESIGN
Floyd E. Ford and B. Bemis (Westinghouse Elec. Corp.) *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 81-87 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A summary of the ATS battery design which is onboard the Applications Technology Satellite (ATS) is provided. The 15 ampere hour nickel cadmium cells were manufactured by Gulton, 19 series connected cells per battery, and there are two batteries in each spacecraft. The operating design life was two years in a synchronous orbit, and a maximum depth of discharge of 50 percent. The design temperature for the batteries in the spacecraft was 0 to 25 C, and the charge control consisted of 1 volt versus temperature on a constant percentage voltage. Also, C/10 current limit, and a commandable trickle charge rate, using C/20 or C/60. The undervoltage was sent across a 9 cell and a 10 cell group, and it was set at one volt average per group on either group. G.Y.

N79-21573*# Comsat Labs., Clarksburg, Md.
INTELSAT BATTERY AND POWER SYSTEM DESIGN
James D. Dunlop and Dennis Cooper (COMSAT Gen. Corp.) *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 89-107 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The orbit data for the Intelsat 4 spacecraft is described. The performance and characteristics of the battery used for this spacecraft are discussed. Graphs are presented which relate battery voltage to various eclipse seasons. G.Y.

N79-21574*# National Aeronautics and Space Administration, Washington, D. C.
NASA'S OAST PROGRAM: AN OVERVIEW
Lee Holcomb *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 111-118 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The program was split into four areas which include: high energy density, long life batteries; low cost high capacity battery application; very high energy density batteries; and electrochemical research and technology program. Outlines are presented which show the approaches used and the accomplishments of each program area. G.Y.

N79-21575*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EFFORT OF THE JET PROPULSION LABORATORY
Sam Bogner *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 119-132 Sponsored by NASA (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A discussion is presented which gives an overview of the research and technological areas on nickel cadmium batteries at the Jet Propulsion Laboratory. Some of the topics covered include: goals; failure modes and mechanisms; factors of degradation and some possible solutions; energy density; and accomplishments for FY 77 and FY 78. G.Y.

N79-21576*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LEWIS RESEARCH CENTER PROGRAM
D. G. Soltis *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 133-136 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

As part of the NASA lightweight battery program, the Lewis Research Center has a number of programs that are being reviewed. A brief and general discussion of these programs is presented. G.Y.

N79-21577*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACCELERATED TEST PROGRAM
Floyd E. Ford and J. M. Harkness (Naval Weapons Support Center) *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 137-140 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A brief discussion on the accelerated testing of batteries is given. The statistical analysis and the various aspects of the modeling that was done and the results attained from the model are also briefly discussed. G.Y.

N79-21578*# Naval Weapons Support Center, Crane, Ind.
STATISTICAL ANALYSIS
Don Mains *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 141-153 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A discussion is presented on the use of statistical analysis to develop a technique that will reliably predict the life of a battery. G.Y.

N79-21579*# Coppin State College, Baltimore, Md.
ANALYSIS OF VOLTAGE DATA
Patrick P. McDermott *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 155-172 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The use of statistical analysis (regression analysis) to determine the data correlation between eight voltage parameters is discussed. The eight parameters correlated include: temperature, depth of discharge; charge rate; discharge rate; percent recharge; concentration of KOH; amount of KOH; and precharge. Graphs are presented which show: (1) starpoint/centerpoint cycles to failure vs. parameters; (2) cycles to failure vs. temperature; and (3) positive and negative plate thickness and weight vs. cycles. An empirical equation derived from cycles to failure vs. temperature graph for cells cycled at 1C charge, 2C discharge, and 14 percent recharge is also presented. G.Y.

N79-21580*# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
PREDICTION TECHNIQUE
John Lander *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 173-179 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Prediction techniques are discussed for the cycle life of nickel cadmium space cells. Equations and graphs which incorporate

such parameters as temperature and recharge are presented. G.Y.

N79-21581*# Coppin State College, Baltimore, Md.
CHARGE AND DISCHARGE PROFILE
Patrick P. McDermott *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 181-195 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Some possible parameters which could be used to predict failures within packs of electrochemical cells based on measurements that are taken while the cells are cycling are discussed. Discharge and charge curves are presented and fitted to measure the efficiency of the cells in terms of voltage vs. time. G.Y.

N79-21582*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTIMISSION MODULAR SPACECRAFT PARALLEL BATTERY TESTS
Charles Palandati *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 197-211 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

An engineering evaluation of the Multimission Modular Spacecraft power supply is presented. The spacecraft has one charger with eight commandable voltage versus temperature levels. Graphs are presented which represent: (1) cell voltage limits vs. temperature; (2) charge ratio vs. temperature; (3) effect of 0.0 percent impedance unbalance at 10 C; (4) shorted cell at 10 C; and (5) discharge voltage profile at 10 C. G.Y.

N79-21583*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
SYNCHRONOUS METEOROLOGICAL AND GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITES OPERATIONAL EXPERIENCE
R. J. Haas *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 213-218 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The mode of operation that is of interest in this discussion is a solar array battery load-sharing mode. The battery is loaded for a fraction of a second and then charged, so the cycle is a 100 millisecond load, followed by a 500 millisecond charge. The purpose of the experiment was to evaluate the charge efficiency and the state of charge. Charge/discharge ratio graphs are presented. G.Y.

N79-21584*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
LONG-TERM STORAGE EFFECTS-UP-DATE
Willard R. Scott *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 219-222 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The long-term effects of storing batteries over a period of years prior to their use in a synchronous orbit application are discussed. A previous experiment is discussed where life testing was performed on cells after having stored the battery for a period of three years with the cell shorted and at a temperature on the order of 5-10 C. The test consisted of performing a sequence of 10 simulated eclipse seasons (equivalent in cycling of five years in synchronous orbit). Results of this test indicated very little degradation and change in the physical and chemical conditions of the cell. The program was extended for an additional year (battery was stored for four years) under the same conditions and testing. The results of the four year storage (one exception) indicate that no further change occurred that is significant from the three year test. G.Y.

N79-21585*# Naval Weapons Support Center, Crane, Ind.
STORAGE EFFECTS ON CELLS
J. M. Harkness *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 223-242 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The results of an experiment to test storage effects on electric cells of a battery are presented and discussed. The type of cells were the 20 amp-hour OAO type. The various modes that were tested were the integration type mode, the trickle charge, the discharge shorted and the discharged OCV (open current voltage). Every six months the cells were reconditioned and approximately two weeks of tests were performed. The tests included three capacity checks, two zero-degree overcharge tests and an internal short test (the cells are shunted for 16 hours, the shunt removed and allowed to stand on local circuit recovery for 24 hours). The integration pack was discontinued after three years and the trickle charge shorted packs after five years. G.Y.

N79-21586*# Defence Research Establishment, Ottawa. (Ontario).
PERFORMANCE OF BATTERY RECONDITIONING ON THE COMMUNICATIONS TECHNOLOGY SATELLITE
Joseph Lackner *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 245-257 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Some real life data on the flight performance and reconditioning on the Communications Technology Satellite are presented. There are two 24-cell nominal 5 amp-hour nickel cadmium batteries on board. The two batteries are operated in parallel with isolating diodes in between and permanently connected to the housekeeping buses. The recharge can be at C over 10 or C over 20 to a 1.4 charge/discharge ratio; and recharge is terminated either when a computed 1.4 charge/discharge ratio is reached, or a charge voltage peak is reached. G.Y.

N79-21587*# TRW, Inc., Redondo Beach, Calif.
BATTERY LIFE TEST USING RECONDITIONING
Richard H. Sparks *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 259-270 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A discussion is presented on nickel cadmium battery life tests using reconditioning and some comparative tests not using reconditioning. The discussion is aimed at the program application part of the testing. The goals of the program were to get an increased utilization out of the battery system in geosynchronous orbit. An attempt was made to push the depth of discharge operation up around 80 to 85 percent and the intent with the reconditioning program was to extend this type of utilization out towards a 10-year life and attune the voltage regulation. G.Y.

N79-21588*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
THE CHARACTERISTICS OF SEALED NICKEL-CADMIUM CELLS DURING VOLTAGE REVERSAL
Paul F. Ritterman *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 271-283 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A mechanism which allows a cell voltage reversal in a nickel cadmium battery are discussed. The effects of reconditioning and the characteristics of Ni-Cd cells during voltage reversal at low overdischarge rates are outlined. Graphs are presented for: (1) hydrogen pressure decay-effect of state of charge (open circuit stand); (2) hydrogen pressure increase during overdischarge; (3) hydrogen pressure decay-effect of temperature (cells terminals connected through resistors); (4) cell, positive and negative electrode voltage during reversal when reconditioning a 13 cell-24-Ah battery pack through a 40 Omega resistor; (5) pressure discharge current and recombination current during voltage reversal when reconditioning a 13 cell-24-Ah battery pack through a 40 Omega resistor; (6) theoretical hydrogen gas pressure if there were no recombination; and (7) effect of hydrogen pressure on recombination rate during overcharge. G.Y.

N79-21589*# Naval Weapons Support Center, Crane, Ind.
EFFECTS OF CELL REVERSAL DURING FLIGHT TESTING
J. M. Harkness *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 285-292 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A discussion on cell reversal during flight is presented. Data

tables and graphs are also presented to clarify the discussion. G.Y.

N79-21590*# RCA American Communications, Inc., Piscataway, N. J.
RECONDITIONING ON SATCOM
Joe Napoli *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 293-304 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A brief history of the SATCOM satellites is given. Cell design and battery operating characteristics are outlined and discussed. Graphs are presented comparing reconditioning parameters such as voltage, temperature, time and discharge. G.Y.

N79-21591*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RECONDITIONING EXPERIENCE AT MARSHALL SPACE FLIGHT CENTER
L. E. Paschal *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 305-313 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Problems encountered on Skylab prompted the development of a reconditioning circuit which involves a DC to DC converter, a circuit sensing device, and the capability of switching several size reconditioners onto a circuit. Across each cell there is a full bridge rectifier. During battery discharge, if there is low cell voltage, the reconditioning systems holds that voltage up and permits discharge to continue on the system. When the cell is good, the voltage is up about one volt, the diodes are back, or reversed biased, and the current drawn out of the system is very low. The system has a standby power thrown at about one volt. As the voltage drops on a cell, the circuit strts picking up the load and helps hold the overall battery voltage up. A.R.H.

N79-21592*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECTS OF PERIODIC DISCHARGES
Floyd E. Ford *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 315-343 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Periodic capacity checks are assessed as well as the effects of periodic discharges on the cycle life and the performance of cells during the cycle life. Topics discussed include the effect of the amount of electrolyte on cell capacity at 35 C; battery design for spacecraft; electrolyte starvation theory; battery separator degradation; negative electrode stability; voltage regulation; operating temperatures; and integration of reconditioning systems using microprocessors. A.R.H.

N79-21593*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DETERMINATION OF OVERCHARGE PROTECTION
Willard R. Scott *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 345-354 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Nylon separator degradation was examined as a function of temperature. Electrochemically active uncharged excess negative (overcharge protection)was measured by charging a cell venting it until it became fully charged, and continuing to overcharge the vent gas. The gas was analyzed as a function of time. The amount of hydrogen evolved was examined, and the cell voltage was observed as the oxygen and/or hydrogen evolved from the cell. A.R.H.

N79-21594*# Ceramaseal, Inc., New Lebanon Center, N. Y. 10c
CERAMIC/METAL SEALS
A. M. Bredbenner *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 355-360 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01

Design criteria are discussed for a hermetic seal capable of withstanding the 450 C operating temperature of a lithium-metal sulfide battery system. A mechanical seal consisting of two high strength alloy metal sleeves welded or brazed to a conductor assembly and pressed onto a ceramic is described. The conductor center passes through the ceramic but is not sealed to it. The seal is effected on the outside of the taper where the tubular part is pressed down over and makes contact. A.R.H.

N79-21595*# Comsat Labs., Clarksburg, Md.
EVALUATION OF POSITIVE PLATES WITH VARIOUS LOADING LEVELS
Gerrit VanOmmering *In* NASA. Goddard Space Flight Center. The 1977 Goddard Space Flight Center Battery Workshop 1977 p 361-376 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The effects of overcharge and total cycling rate on one electrochemically impregnated and four chemically impregnated nickel electrodes are examined. Topics discussed include porosity distribution, electrode corrosion, electrolyte absorption and positive electrode involvement in the decrease in the amount of electrolyte in the separator. The electrochemically impregnated electrode is shown to be superior to all types of conventionally impregnated electrodes regardless of the loading level. A.R.H.

N79-21596*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
ANALYSIS OF AEROSPACE NICKEL-CADMIUM BATTERY CELLS
R. R. Eliason *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 377-388 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Various steps followed in analyzing the electrolyte, separator, and electrodes are reviewed. Specific emphasis is given to scanning electron microscopic and metallographic analysis of the plates. Cadmium migration is defined, its effects and causes are examined, and methods for its reduction in cells are suggested. A.R.H.

N79-21597*# Hughes Research Labs., Malibu, Calif.
NYLON SEPARATORS
Hong S. Lim *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 389-398 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A nylon separator was placed in a flooded condition in KOH solution and heated at various high temperatures ranging from 60 C to 110 C. The weight decrease was measured and the molecular weight and decomposition product were analyzed to determine: (1) the effect of KOH concentration on the hydrolysis rate; (2) the effect of KOH concentration on nylon degradation; (3) the activation energy at different KOH concentrations; and (4) the effect of oxygen on nylon degradation. The nylon hydrolysis rate is shown to increase as KOH concentration is decreased 34%, giving a maximum rate at about 16%. Separator hydrolysis is confirmed by molecular weight decrease in age of the batteries, and the reaction of nylon with molecular oxygen is probably negligible, compared to hydrolysis. The extrapolated rate value from the high temperature experiment correlates well with experimental values at 35 degrees. A.R.H.

N79-21598*# RAI Research Corp., Hauppauge, N. Y.
PROPERTIES OF NICKEL-CADMIUM SEPARATORS
J. Lee *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 399-408 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The thickness, moisture content, exchange capacity, tensile strength, diffusion characteristics, stability, and electrical properties are discussed for the 2291 radiation-grafted separator used in military vented nickel cadmium aircraft batteries. A regression analysis of separator resistance as a function of temperature and KOH concentration is included. A.R.H.

N79-21599*# General Electric Co., Philadelphia, Pa. Space Div.
CELL CASES FOR DISCUS 3
Helmut Thierfelder *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 409-417 (For primary document see N79-21565 12-44)

Avail: NTIS HC A25/MF A01 CSCL 10C

Batteries designed for the defense satellite communications system were modified to meet increased power requirements. A stainless steel case for the cell, approximately 4 inches wide, 4 1/2 inches high and 1 inch thick, with a weld down a narrow edge, has 12 mil 304-L stainless steel side walls and a 19 mil 304-L stainless bottom. A dip-brazed 60-61 aluminum retainer is electrically separated from the steel case by 15 mils of potting compound. The thickness of the compound varies from 10 to 20 mils, except at the bottom, where it is 20 to 30 mils thick. Pressure test results are discussed. A.R.H.

N79-21600*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EPOXY GRAPHITE CELL CASES
Sam Bogner *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 419-427 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The graphite epoxy cell case and header developed as a means of weight reduction are discussed. Aspects considered include gas permeability, KOH compatibility, pressure and structural dynamic integrity, fiber orientation, fabrication process, cover-to-case sealing, terminal installation and sealing, reproducibility, exposure to the extractable materials that might influence the electrochemical portion of the cell, and electrical conductivity between the terminals. A.R.H.

N79-21601*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE STANDARD 20 AH CELL, A STATUS REPORT
Gerald Halpert *In its* The 1977 Goddard Space Flight Center Battery Workshop 1977 p 431-435 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Progress of four contractors in producing standard 20 AH nickel-cadmium cells meeting a capacity requirement of 24 + or - 2 AH and an envelope requirement listed in NASA/GSFC specification S-711-17 is reported. Among the requirements were 10 burn in cycles 24 C, 0 C, and 35 C capacity tests, charge efficiency tests and precharge verification tests. A.R.H.

N79-21602*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
THE STANDARD 20 AH BATTERY
Maurice T. Zollner *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 437-450 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The modular power system, which is the first intended use for the NASA standard battery, is basically a four foot by four foot by eighteen inch box which can handle a complement of three 20 ampere hour batteries or later on the intended use is for three 50 ampere hour batteries to be the full complement. The system is designed to be used as a plug on component on a multi mission modular spacecraft. It has as a design point a basically 1250 watt orbital average load. The way it breaks up in a near earth orbit it would be somewhere around 1,000 watts for everything except 10 minutes, and during any 10 minute period it may go up to a peak of 3,000 watt load. Features of the battery reviewed include criteria to store electrical energy, the battery package, the covers and cases, and electrolytes. The capacities expected are 90 percent, the average cell capacity for 24 C, 90 percent of the actual battery capacity of 19 C, and 85 percent of the actual 25 degree battery capacity at zero discharge voltage for 50 percent DOD new battery is in the vicinity expected or predicted of 26.4 volts. A.R.H.

N79-21603*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
THE 100 kW SPACE STATION
George McKhann *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 451-461 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Solar array power systems for the space construction base are discussed. Nickel cadmium and nickel hydrogen batteries are equally attractive relative to regenerative fuel cell systems at 5 years life. Further evaluation of energy storage system life (low orbit conditions) is required. Shuttle and solid polymer electrolyte fuel cell technology appears adequate; large units (approximately four times shuttle) are most appropriate and should be studied for a 100 KWe SCB system. A conservative NiH2 battery DOD (18.6%) was elected due to lack of test data and offers considerable improvement potential. Multiorbit load averaging and reserve capacity requirements limit nominal DOD to 30% to 50% maximum, independent of life considerations. Author

N79-21604*# Grumman Aerospace Corp., Bethpage, N.Y.
THE 25 kN SPACE STATION
Bruce Clark *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 463-474 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The capabilities of photovoltaic, nuclear reactor, and solar thermal systems are assessed for the space construction base. Topics covered include Brayton conversion, thermionic conversion, and thermo-electric conversion. The effectiveness of nickel cadmium and nickel hydrogen batteries are discussed as well as that of regenerative fuel cells. The verification of long cycle life for nickel hydrogen systems is recommended. A.R.H.

N79-21605*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ENERGY STORAGE CYCLING TESTS
B. J. Bragg *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 475-478 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Results of cyclic tests on seven 3-cell 100 A-H nickel cadmium batteries on 1.5 hr cycles are presented. The failure of the nylon and polypropylene separators was not analyzed. A.R.H.

N79-21606*# Hughes Aircraft Co., Los Angeles, Calif.
LOW ORBIT NICKEL-HYDROGEN BATTERY DEVELOPMENT
Howard H. Rogers *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 481-487 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Test data developed primarily on low earth, but also some accelerated synchronous orbit data are presented for first 40 hour ampere hour boiler plate cells. Graphic data show the following characteristics: charge/discharge voltage; charge/discharge temperature; voltage; pressure; temperature; and discharge voltage. A.R.H.

N79-21607*# Naval Research Lab., Washington, D. C.
THE NTS-2 NICKEL-HYDROGEN BATTERY
Fred Betz *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 489-498 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Features of the first operational nickel hydrogen battery are described as well as experiences encountered during its testing and installation. Battery performance since launching of the NTS-2 satellite is discussed. A.R.H.

N79-21608*# Eagle-Picher Industries, Inc., Joplin, Mo.
AIR FORCE NICKEL-HYDROGEN EXPERIMENT
Bill Harsch *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 499-516 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

An experiment to obtain some flight experience with a nickel-hydrogen battery in low earth orbit is described. The battery was built to be as compatible with the satellite bus as possible because the satellite bus is used for recharge power. The battery is mounted on an experimental pallet on the satellite. It has its own charge control system, a modification of an existing system that is used for nickel-cadmium, which primarily uses temperature compensated voltage as its criteria. Also, on the pallet is a load bank, a resistive load band, which allows switch to various load regimes. There is some other equipment on the satellite such

as the nickel-hydrogen battery to power it. Monitors attached to the 21-cell battery are described. A.R.H.

N79-21609*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
AIR FORCE NICKEL-HYDROGEN TEST PROGRAM
Martin G. Gandel *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 517 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

After using all the instrumentation that is available on a nickel hydrogen battery it will be subjected to the same low earth orbit cycles experienced by the sixty amphere hour nickel cadmium batteries now being flown on some low earth orbit missions. The objective of the test is to demonstrate real differences between the two batteries. In order to simulate flight conditions, the thermal environment and criteria for charge control will vary. The depth of discharge will be increased and testing will continue until some failures or some degradation or spread between cell performances are revealed. Different charge control modes are being considered in order to demonstrate a reasonable life for the nickel hydrogen battery. A.R.H.

N79-21610*# Eagle-Picher Industries, Inc., Joplin, Mo.
MULTISTACK NICKEL-HYDROGEN UNITS
Jim Smith *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 519-524 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

A typical 625 Inconel pressure vessel, equipped with four thermocouples, has voltage taps not only for the cell, but for each of the several packs inside the container. In a two-stack design, a weld ring is used to separate the packs which, joined together, form one solid group. In the four-stack design, stacks are separated mechanically with about half inch Plexiglas and are connected through the center. Electrolytes are forced out by vacuum. The two stack design is intended for 500 psi and was pressure tested up to 1,000. The problem of electrolyte shorts is discussed and possible solutions for its correction are given. A.R.H.

N79-21611*# EIC, Inc., Newton, Mass.
SELF DISCHARGE OF NICKEL-HYDROGEN CELLS
Gerhard Holleck *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 525-531 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Values for the capacity loss with time, naturally on open circuit stand, and information regarding the minimum amount of circuit charge needed to keep the cell charged can be determined from the self-discharge behavior of nickel hydrogen cells. Furthermore, the rate of reaction between hydrogen and a charged nickel electrode is also open for nickel cadmium batteries. In a nickel hydrogen cell, the hydrogen is stored as pressurized gas and the cell stack with the charge that is oxidized nickel-hydroxide electrode is in direct contact with the hydrogen. Therefore, the rate of reaction can be measured easily and precisely by monitoring the charge, the change in hydrogen pressure with time. Measures made on twelve 15 ampere hour nickel hydrogen cells of different stack configurations built for COMSAT are discussed. A.R.H.

N79-21612*# Bell Telephone Labs., Inc., Murray Hill, N. J.
NICKEL-HYDROGEN
E. J. McHenry *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 533-543 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Because of the disintegration of LaNi5 as the lattice expands on absorbing hydrogen, a nickel hydrogen cell similar to a nickel cadmium cell was designed. The positive electrode is wrapped in a microporous separator and the leads are insulated. A negative conducting grid is inserted and welded to the top of the can into an open ended container which is then turned upside down and filled so that LiNa5 powder occupies all the space not used by the rest of the components. The bottom of the can is then welded on. A fill tube is located either on the bottom or on the top of the can. When welded shut, the cell is put into a pressure bomb and the lanthanum nickel is activated at about 1,000 pounds of hydrogen. Electrolytes are added to the cell as well as whatever amount of hydrogen precharge desired, and the cell is sealed. Advantages and disadvantages of the cell are discussed. A.R.H.

N79-21613*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHUTTLE SAFETY
B. J. Bragg *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 545-556 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Experiences with batteries for the Apollo Soyuz Test Project are related and the need for safety criteria for space shuttle orbiter and payload battery handling and design is assessed. A.R.H.

N79-21614*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LITHIUM CELL TEST RESULTS
B. J. Bragg *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 557-567 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Three lithium SO2 cells, two lithium CF cells, and a vinyl chloride cell, all with crimped seals, and all strictly experimental, were independently discharged on resistors. Three temperatures were used and several different storage temperatures. Discharge rate generally on the nominal discharges were 0.1 amp, 0.5 amp, and 1 amp. Tests results show that the crimp seals are inadequate, especially for the SO2 cells. Normal discharges present no hazards. All cells discharge to zero. The problem of lithium cell explosions, such as occurred during off-limits testing, is discussed. A.R.H.

N79-21615*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LITHIUM CELL TESTS AT LANGLEY RESEARCH CENTER
James Bene *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 565-580 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

The long duration exposure facility mission places temperature requirements of from -30 F to +150 F on the batteries to be used. A hermetically sealed lithium sulfur dioxide cell was tested to predict what the temperature of the battery would be over a given spectrum of temperatures of operation. Near the end of cell discharge, as the voltage started collapsing, a very high heat output rise due to chemical reaction took place. However, if the cells were thermally insulated, they vented, ignited, and burned if an attempt was made to discharge them all the way. The cells do not go into reversal. It was determined that the root of the problem was probably the chemical reaction between the lithium and the acetonitrite solvent. A redesigned cell is discussed as well as some alternates. A.R.H.

N79-21616*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LITHIUM CELL TESTS AT MARSHALL SPACE FLIGHT CENTER
L. E. Paschal *In* NASA. Goddard Space Flight Center The 1977 Goddard Space Flight Center Battery Workshop 1977 p 581-589 (For primary document see N79-21565 12-44)
Avail: NTIS HC A25/MF A01 CSCL 10C

Three 18 AH Li-CF batteries with a polypropylene separator and using dimethyl sulfite in Li as F6 for the electrolyte will be placed in each shuttle solid rocket booster for range safety and frustrum location aid. Mechanical vibration. acceleration, random and design vibration, and discharge evaluation tests are discussed. A.R.H.

N79-21617*# North Carolina Science and Technology Research Center, Research Triangle Park.
RESULTS OF HEATING MODE PERFORMANCE TESTS OF A SOLAR-ASSISTED HEAT PUMP Final Report
Clay B. Jones and Frederick O. Smetana Apr. 1979 83 p refs
(Contract NAS1-14208)

(NASA-CR-3112) Avail: NTIS HC A05/MF A01 CSCL 10A

The performance of a heat pump, utilizing 8.16 square meters of low-cost solar collectors as the evaporator in a Freon-114 refrigeration cycle, was determined under actual insolation conditions during the summer and fall of 1976. C.O.P.'s (coefficient of performance) greater than 3 were obtained with condensing temperatures around 78 C and evaporating temperatures around 27 C. Ambient temperatures were about 3 C above evaporating temperatures. Similar performance levels were obtained at other insolation and temperature conditions. Experience with the system has identified some component and system changes which should increase the obtainable C.O.P. to about 4.0. These are described along with the systems's design rationale. The accumulated data are presented as an appendix. Author

N79-21618*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DEVELOPMENT, TESTING, AND CERTIFICATION OF THE NORTHRUP, INC., ML SERIES CONCENTRATING SOLAR COLLECTOR MODEL NSC-01-0732 Final Report

John C. Parker Mar. 1979 27 p refs

(NASA-TM-78219) Avail: NTIS HC A03/MF A01 CSCL 10A

A summary is presented of the additional development work on the existing ML Series concentrating solar collector for use with solar heating and cooling systems. The report discusses the intended use of the final report, describes the development hardware, lists deliverable end items, deals with problems encountered during fabrication and testing, and includes certification statements of performance. This report shows that the products developed are marketable and suitable for public use. L.S.

N79-21619*# Sunkeeper Control Corp., Andover, Mass.

DESIGN PACKAGE FOR PROGRAMMABLE CONTROLLER AND HYDRONIC SUBSYSTEM

Mar. 1979 28 p Prepared for DOE

(Contract NAS8-32257)

(NASA-CR-161151) Avail: NTIS HC A03/MF A01 CSCL 10A

Information used in the evaluation of design of Sunkeeper Control's electronic controllers and hydronic packages is discussed. This information includes system performance specifications, a design data brochure, drawings, and qualification and acceptance test procedures. L.P.

N79-21620*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DEVELOPMENT, TESTING, AND CERTIFICATION OF OWENS-ILLINOIS MODEL SEC-601 SOLAR ENERGY COLLECTOR SYSTEM Final Report

John C. Parker Mar. 1979 22 p refs Prepared for DOE

(NASA-TM-78223) Avail: NTIS HC A02/MF A01 CSCL 10A

The final results are presented of the additional development work on the existing air-cooled solar energy collector subsystem for use with solar heating and cooling systems. The report discusses the intended use of the final report, describes the deliverable end items, lists program objectives, relates how they were accomplished, deals with problems encountered during fabrication and testing, and includes a certification statement of performance. The report shows that the products developed are marketable and suitable for public use. L.S.

N79-21621*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.

LONG TERM WEATHERING EFFECTS ON THE THERMAL PERFORMANCE OF THE SOLARON (AIR) SOLAR COLLECTOR

Mar. 1979 12 p refs Prepared for DOE

(Contract NAS8-32036)

(NASA-CR-161166) Avail: NTIS HC A02/MF A01 CSCL 10A

The test procedures and the results obtained during the evaluation test program on the Solaron Corporation air-type solar collector are presented. The tests were performed under simulated conditions, following long-term exposure to natural weathering conditions. The Solaron Model 2001, air-type solar collector has a gross area of 19 square feet and the weight is 160 pounds. The absorber plate is made of 24-gage steel, the coating is baked-on black paint, the cover consists of two sheets of 1/8-inch low-iron tempered glass, and the insulation is one thickness of 3 5/8-inch fiberglass batting. L.S.

N79-21622*# General Electric Co., Wilmington, Mass. Aircraft Equipment Div.

SOLID POLYMER ELECTROLYTE (SPE) FUEL CELL TECHNOLOGY PROGRAM Final Report

22 Mar. 1979 73 p

(Contract NAS9-15286)

(NASA-CR-160159; TPR-59) Avail: NTIS HC A04/MF A01 CSCL 10A

The overall objectives of the Phase IV Solid Polymer Electrolyte Fuel Cell Technology Program were to: (1) establish fuel cell life and performance at temperatures, pressures and current densities significantly higher than those previously demonstrated; (2) provide the ground work for a space energy storage system based on the solid polymer electrolyte technology (i.e., regenerative H2/O2 fuel cell); (3) design, fabricate and test evaluate a full-scale single cell unit. During this phase, significant progress was made toward the accomplishment of these objectives. G.Y.

N79-21623# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.

THERMAL ANALYSIS OF SOME COMPONENTS OF THE LiSO2 CELL

William P. Kilroy and Steven Dallek 13 Nov. 1978 47 p (SR0240202)

(AD-A062983; NSWC/WOL/TR-78-156) Avail: NTIS HC A03/MF A01 CSCL 10/3

Safety problems associated with heat generation in the Li/SO2 system were investigated using differential scanning calorimetry. Various binary mixtures of cell components were found to undergo explosive combustion. Ignition temperatures and cell temperature increases were determined. Passivation of some exothermic reactions were observed on addition to other cell components to some binary mixtures. Author (GRA)

N79-21624# Army Facilities Engineering Support Agency, Fort Belvoir, Va.

ENERGY UTILIZATION SURVEY PAMPHLET FOR BUILDINGS Final Report

Peter E. Baum and Harold D. Hollis 26 Apr. 1978 42 p refs

(AD-A062930; USAFESA-RT-2052) Avail: NTIS HC A03/MF A01 CSCL 05/1

This pamphlet provides guidelines and forms to conduct an energy utilization survey of individual buildings and facilities on an installation. Forms are provided in this pamphlet for collection of information describing facility and individual building energy comsumption. This information is needed to use energy conservation manuals which provide guidance on how to reduce and save energy through more effective operation of buildings and their mechanical and electrical systems, and through cost effective retrofit of existing systems. A list of these manuals is provided in Appendix A. Author (GRA)

N79-21625# Versar, Inc., Springfield, Va.

ASSESSMENT OF COAL CLEANING TECHNOLOGY: AN EVALUATION OF CHEMICAL COAL CLEANING PROCESSES Final Report, Apr. - Dec. 1977

G. Y. Contos, I. F. Frankel, and L. C. McCandless Aug. 1978 299 p refs

(Contract EPA-68-02-2199)

(PB-289493/9; EPA-600/7-78-173a) Avail: NTIS HC A13/MF A01 CSCL 07A

Technical and economic information on chemical coal cleaning processes is assembled and assessed. Sufficient data was located to evaluate 11 processes in detail. It was found that chemical coal cleaning processes can remove up to 99% of the pyritic sulfur and 40% of the organic sulfur, resulting in total sulfur removals of 53 to 77%. This performance can be achieved with heat value recoveries of 57 to 96%. Processes which remove only pyritic sulfur were generally judged to have the highest probabilities of success. Of techniques which remove both pyritic and organic sulfur, the ERDA and GE microwave processes were judged to have the highest probabilities of success. GRA

N79-21626# Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
ENERGY CONSERVATION THROUGH SOURCE REDUCTION Final Report
George W. Reid and Chan Hung Khuong Nov. 1978 76 p refs
(Grant EPA-R-804183)
(PB-290126/2; EPA-600/8-78-015) Avail: NTIS HC A05/MF A01 CSCL 10A

Energy conservation through reduction in generation of post-consumer solid waste is reported. Output and input approaches to estimate the quantity and composition of post-consumer solid water were reviewed. Estimates of energy consumed in the manufacture of discarded materials and in handling the solid waste are compiled. Potentials and possibilities of reducing refuse and estimates of corresponding energy savings were studied. Twenty examples of opportunities to reduce refuse at government, policy-maker, manufacturer, and consumer levels are proposed. The energy intensiveness of materials found in the waste stream, total energy residuals embedded in each material, and possible candidates for reduction with greatest energy savings are presented. GRA

N79-21627# National Bureau of Standards, Washington, D. C. Center for Building Technology.
PERFORMANCE GUIDELINES FOR A MODULAR INTEGRATED UTILITY SYSTEM
David J. Mitchell Nov. 1978 93 p Sponsored in part by HUD
(PB-289783/3; NBSIR-78-1395) Avail: NTIS HC A05/MF A01 CSCL 13A

This document defines generic performance of a MIUS serving a residential/commercial development. These performance requirements, criteria, and evaluations identify engineering parameters and other constraints associated with electrical service, thermal energy, solid waste management, potable water management, and wastewater management provided by a single, local, integrated source. These are also performance requirements, criteria, and evaluations for end-use considerations such as environmental impact, health, safety, and subjective acceptability. GRA

N79-21628# California Energy Commission, Sacramento.
CONSERVATION WHERE IT COUNTS: ENERGY MANAGEMENT SYSTEMS Final Report
Dick Foley Jan. 1978 14 p
(PB-289837/7; CAEC-002) Avail: NTIS HC A02/MF A01 CSCL 13A

This report aids managers of commercial buildings or industrial plants in identifying energy waste and controllable energy loads, and in choosing the right load control system for heating, ventilating, and air conditioning (HVAC) equipment. A method for calculating a building's energy budget is explained, and the U. S. General Services Administration energy budget guideline is given as a comparison. Energy saving equations are provided to help establish realistic energy waste reducing goals. Techniques for reducing the operating time of lights and HVAC equipment -- demand limit load shedding, optimization of equipment running time, fixed start-stop schedules, and load cycling -- are discussed. The various types of control equipment, from elaborate central mini-computer or micro-computer systems to simpler and less expensive programmable controllers or disbursed black box systems, are described, and approximate purchase costs are given. Checklists for comparing hardware costs are included. GRA

N79-21629# National Bureau of Standards, Washington, D. C. Center for Building Technology.
CLIMATE DATA ABBREVIATION FOR THE COMPUTERIZED CALCULATION OF HEATING AND COOLING REQUIREMENTS IN BUILDINGS
Edward A. Arens and Daniel H. Nall Dec. 1978 67 p refs
(PB-289927/6; NBSIR-78-1525) Avail: NTIS HC A04/MF A01 CSCL 13A

This report documents the development of a climate data abbreviation technique for building thermal analysis. It discusses the characteristics of computerized building thermal simulations and the requirements for abbreviated data. The technique is then described together with the statistical analyses used to develop it. A series of tests of the representativeness of the abbreviated climate data are documented and the limitations and potentials of the abbreviation technique are discussed. GRA

N79-21630# National Bureau of Standards, Washington, D. C. Building Economics and Regulatory Technology Div.
INTERIM PERFORMANCE CRITERIA FOR SOLAR HEATING AND COOLING SYSTEMS IN RESIDENTIAL BUILDINGS, SECOND EDITION Final Report
John K. Holton Nov. 1978 113 p refs Sponsored in part by HUD
(PB-289967/2; NBSIR-78-1562) Avail: NTIS HC A06/MF A01 CSCL 13A

The interim performance criteria, developed for the Department of Housing and Urban Development, are criteria and standards for the design, development, technical evaluation and procurement of the solar heating and cooling systems to be used in residential buildings during the solar heating and cooling demonstration program authorized by the Solar Heating and Cooling Demonstration Act of 1974. These interim criteria are intended primarily for use in the solar residential demonstration program and as a basis for the preparation of definitive performance criteria. GRA

N79-21631# NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
REPORT OF THE 4TH CCMS (COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY) SOLAR ENERGY PILOT STUDY MEETING
Sheila Blum and Redfield W. Allen Aug. 1978 159 p Conf. held at Dusseldorf, Germany, 17-18 Apr. 1978 Prepared in cooperation with Maryland Univ., College Pk.
(Contract EY-76-S-05-4908)
(PB-289492/1; NATO/CCMS-84) Avail: NTIS HC A08/MF A01 CSCL 10A

The cost effectiveness and practical application of solar energy to heating and cooling in buildings were examined. The final Solar Energy Pilot Study Meeting is summarized, and recommendations for continued international cooperation are made. Author

N79-21632# National Bureau of Standards, Washington, D. C. National Engineering Lab.
EXPERIMENTAL VERIFICATION OF A STANDARD TEST PROCEDURE FOR SOLAR COLLECTORS
James E. Hill, John P. Jenkins, and Dennis E. Jones Jan. 1979 131 p refs Sponsored in part by DOE
(PB-289912/8; NBS-BSS-117; LC-78-600138) Avail: NTIS HC A06/MF A01 CSCL 14B

A proposed procedure for testing and rating solar collectors based on thermal performance was published by the National Bureau of Standards (NBS) in 1974. The American Society of Heating, Refrigerating, and Air Conditioning (ASHRAE) developed a modified version of the NBS procedure which was adopted in early 1977 as ASHRAE Standard 93-77. A test facility for water-heating and air-heating collectors was built at NBS and was used to support the development of Standard 93-77. The recently adopted test procedure, the NBS test facility, and the tests that were conducted to support the development of the procedure are described. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N79-21633 California Univ., Berkeley.
ECONOMIC BENEFITS OF CONTROLLING SULFUR OXIDE EMISSIONS FROM STATIONARY SOURCES Ph.D. Thesis
Jane Vise Hall 1977 166 p
Avail: Univ. Microfilms Order No. 7908885

The possible health consequences of increased sulfur emissions in a populated area are discussed. These consequences are then translated into dollar values and compared with the cost of controlling sulfur emissions. Public health literature related to the effect of sulfur oxides on human health is reviewed. The

review covers toxicological, clinical, and epidemiological studies on both morbidity and mortality. The methods, shortcomings and results of each study are summarized. Dissert. Abstr.

N79-21634 Tufts Univ., Medford, Mass.
POLYCYCLIC AROMATIC HYDROCARBONS IN THE SEDIMENTARY ENVIRONMENT Ph.D. Thesis
Robert Emile LaFlamme 1978 208 p
Avail: Univ. Microfilms Order No. 7907211

Complex mixtures of PAH have been found in several soils and sediments. The alkyl homolog distributions and relative abundances of the individual species suggest a combustion source. Some controversy exists as to whether this combustion is natural or anthropogenic. In order to address this controversy, fifty soils and sediments from many areas of the globe have been analyzed for PAH using gas chromatographic mass spectrometry. The results of these analyses indicate that PAH are ubiquitous. The source of most of the PAH in these samples is combustion. The concentrations of PAH are highest in areas of high anthropogenic activity. PAH concentrations relative to distance from anthropogenic point sources also indicate that the source of PAH in the sediments is man's activity. The historical record of PAH input into two sediment cores not only confirms this fact but shows a rapid increase of PAH burden in the sedimentary environment at the beginning of the twentieth century. Dissert. Abstr.

N79-21635 Texas Univ. Health Science Center, Houston.
POPULATION RADIATION DOSES ATTRIBUTABLE TO RADON-222 IN GROUND WATERS IN GREATER HOUSTON, TEXAS Ph.D. Thesis
Howard Milton Prichard, III 1978 159 p
Avail: Univ. Microfilms Order No. 7909162

A new analytical technique based on the extraction of radon from water by a liquid scintillation solution was developed to facilitate the water sampling program. Other sampling methods involved the use of alpha particle scintillation flasks and a continuous radon monitor based on the electrostatic precipitation of radon progeny ions. The experimental aspect of the project was directed toward characterizing the distribution of radon in the area water systems and toward evaluating the extent to which the use of waters containing radon augmented the airborne radon levels in dwellings. It was found that about half of the radon introduced into a dwelling is released to the air during the course of domestic water use. The application of appropriate census data and published dosimetric models to the experimental data led to estimates of the incremental population doses in the Houston area. For a population of 1.6 x 10 to 6th power people and an average concentration of radon in water of about 500 pCi/1, a lung dose on the order of 70,000 person-rem per year was estimated. The stomach dose due to the ingestion of the water was estimated to be on the order of 4000 person-rem per year. Dissert. Abstr.

N79-21636 Michigan Univ., Ann Arbor.
PHOTOCHEMICAL OZONE AND NITRIC OXIDE FORMATION IN AIR AND NITROGEN DIOXIDE MIXTURES CONTAINING SULFUR DIOXIDE, CHLORINE, OR HYDROGEN SULFIDE Ph.D. Thesis
James Simpson Wallace 1978 334 p
Avail: Univ. Microfilms Order No. 7907197

Experiments were performed to investigate the effects of sulfur dioxide, chlorine, and hydrogen sulfide on ozone and nitric oxide concentrations in irradiated mixtures of air and nitrogen dioxide. The mixtures were irradiated by ultraviolet fluorescent lamps while flowing at a steady speed through a 9.12 m long, 15.2 cm i.d. Pyrex tube. The concentrations of ozone, nitric oxide, and condensation nuclei were measured at various points along the tube. Measurements were performed to assess the effects of surface reactions on the results. These measurements were used in conjunction with gas phase reaction models to estimate the magnitude of the surface reactions. Correction factors were developed which were used to correct the data for surface effects. Dissert. Abstr.

N79-21637*# Delaware Univ., Newark. College of Marine Studies.
DETECTION OF OCEAN WASTE IN THE NEW YORK BIGHT
Final Report
W. Philpot and V. Klemas 30 Mar. 1979 43 p refs
(Grant NsG-1398)
Avail: NTIS HC A03/MF A01 CSCL 13B

The application of remote sensing to detection and monitoring of ocean waste disposal in the New York Bight is discussed. Attention is focused on the two major pollutants in this area--sewage sludge and iron-acid waste--and on detecting and identifying these pollutants. The emphasis is on the use of LANDSAT multispectral data in identifying these pollutants and distinguishing them from other substances. The analysis technique applied to the LANDSAT data is the eigenvector. This approach proved to be quite successful in detecting iron-acid waste of the coast of Delaware and is applied here with relatively minor modifications. The results of the New York Bight work are compared to the Delaware results. Finally, other remote sensing systems (Nimbus G, aircraft photography and multispectral scanner systems) are discussed as possible complements of or replacements for the Landsat observations. L.S.

N79-21638# Battelle Columbus Labs., Ohio.
AEROSOL MEASUREMENTS AND MODELING FOR FAST REACTOR SAFETY Annual Report, 1 Oct. 1977 - 31 Sep. 1978
J. A. Gieseke, K. W. Lee, H. Jordan, and L. D. Reed Feb. 1979 70 p refs
(Contract NRC-04-76-293-07)
(BMI-2021; NUREG-CR-0676) Avail: NTIS HC A08/MF A01

The areas of major activity during that year were: development and subsequent sensitivity study of the HAARM-3 code; development of a code to study multiple zone effects; completion of the basis form of the reference code, CRAB; and measurements on fuel aerosol particles. Results of these activities are presented. In addition, an appendix contains a compilation of experimental data on nuclear aerosols that have become available since the publication of a similar compilation in the previous annual report for this program. L.S.

N79-21639# California Univ., Livermore. Lawrence Livermore Lab.
MULTIPLE SOURCE DISPERSION MODEL
Donald L. Ermak and Robert A. Nyholm 16 Oct. 1978 70 p refs
(Contract W-7405-eng-48)
(UCRL-52592) Avail: NTIS HC A04/MF A01

The Multiple Source Dispersion Model computer code calculates pollutant concentrations and surface deposition rates from a large number of point sources and within a spatial range of approximately 100 km. The model uses the Gaussian plume concept with modifications to simulate the effects of plume rise, first-order chemical transformations, gravitational settling, surface deposition, and an inversion layer. It employs two modes of operation: climatological and instantaneous. The climatological mode calculates long-term (monthly to yearly) averages using a joint frequency distribution of wind speed, wind direction, and atmospheric stability for the time period over which the average is to be taken. The instantaneous mode calculates short-term (hourly) averages for a specific set of meteorological conditions. Technical details of the model with a description of the data requirements and the program output are also presented. Author

N79-21640# Oak Ridge National Lab., Tenn.
AN INVENTORY OF ENVIRONMENTAL IMPACT MODELS RELATED TO ENERGY TECHNOLOGIES
P. T. Owen, ed., N. S. Dailey, ed., C. A. Johnson, ed., and F. M. Martin, ed. Feb. 1979 410 p
(Contract W-7405-eng-26)
(ORNL/EIS-147) Avail: NTIS HC A18/MF A01

An inventory is presented which identifies and collects data on computer simulations and computational models related to the environmental effects of energy source development, energy conversion, or energy utilization. In addition to the standard bibliographic information, other data fields of interest to modelers, such as computer hardware and software requirements, algorithms, applications, and existing model validation information, are included. Indexes are provided for contact persons, acronym, keyword, and title. The models are grouped into the following categories: atmospheric transport, air quality, aquatic transport,

terrestrial food chain, soil transport, aquatic food chain, water quality, dosimetry and human effects, animal effects, plant effects, and generalized environmental transport. G.Y.

N79-21641*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SAGE GROUND TRUTH PLAN: CORRELATIVE MEASUREMENTS FOR THE STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE) ON THE AEM-B SATELLITE
P. B. Russell, ed. (SRI International, Menlo Park, Calif.), D. M. Cunnold (MIT, Cambridge, Mass.), G. W. Grams (Ga. Tech., Atlanta), J. Laver (NOAA, Wash. D.C.), M. P. McCormick, L. R. McMaster, D. G. Murcray, T. J. Pepin (Wyoming Univ., Laramie), T. W. Perry (NASA, Wallops Station, Va.), W. G. Planet (NESS, Wash. D.C.) et al Mar. 1979 163 p refs
(NASA-TM-80076) Avail: NTIS HC A08/MF A01 CSCL 04A

The ground truth plan is outlined for correlative measurements to validate the Stratospheric Aerosol and Gas Experiment (SAGE) sensor data. SAGE will fly aboard the Applications Explorer Mission-B satellite scheduled for launch in early 1979 and measure stratospheric vertical profiles of aerosol, ozone, nitrogen dioxide, and molecular extinction between 79 N and 79 S. latitude. The plan gives details of the location and times for the simultaneous satellite/correlative measurements for the nominal launch time, the rationale and choice of the correlative sensors, their characteristics and expected accuracies, and the conversion of their data to extinction profiles. In addition, an overview of the SAGE expected instrument performance and data inversion results are presented. Various atmospheric models representative of stratospheric aerosols and ozone are used in the SAGE and correlative sensor analyses. L.S.

N79-21642# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
LEAD: AN EPIDEMIOLOGICAL LOOK AT POTENTIAL SOURCES OF CONTAMINATION M.S. Thesis - Cincinnati Univ.
Wiley Taylor 1978 93 p refs
(AD-A061674; AFIT-CI-79-60T) Avail: NTIS HC A05/MF A01 CSCL 06/20

This thesis is a critical review of the literature on the occurance of lead, lead products, and their intrarelationship to the epidemiology of lead poisoning. GRA

N79-21643# Research Triangle Inst., Research Triangle Park, N. C.
NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. INSPECTION MANUAL FOR VINYL CHLORIDE
Michael F. Lamorte May 1978 123 p
(Contract EPA-68-01-4141)
(PB-289778/3; RTI-41U-3172-2) Avail: NTIS HC A06/MF A01 CSCL 07A

The guidelines for the benefit of the standardized procedures to be followed by EPA field inspectors or their designated representatives are presented. In conjunction with the operator's testing and monitoring results and the required recording and recordkeeping of these results, the basic enforcement tools are readily available to properly trained field inspectors. The degree to which this portion of the NESHAPs program is successful depends critically on the effectiveness and efficiency with which inspectors conduct field inspections. GRA

N79-21644# Environmental Monitoring and Support Lab., Cincinnati, Ohio.
MICROBIOLOGICAL METHODS FOR MONITORING THE ENVIRONMENT. WATER AND WASTES Final Report
Robert H. Bordner, John A. Winter, and Pasquale Scarpino (Cincinnati Univ., Ohio) Dec. 1978 357 p refs
(Contract EPA-68-03-0431)
(PB-290329/2; EPA-600/8-78-017) Avail: NTIS HC A16/MF A01 CSCL 13B

This first EPA manual contains uniform laboratory and field methods for microbiological analyses of waters and wastewaters, and is recommended in enforcement, monitoring and research activities. The procedures are prepared in detailed, stepwise form for the bench worker. Coliform, fecal coliform, fecal streptococci, Salmonella, actinomycetes, and Standard Plate Count organisms with the necessary support sections on sampling, equipment, media, basic techniques safety, and quality assurance are included. GRA

N79-21645# TRW Systems Group, Redondo Beach, Calif.
PROCESS MEASUREMENTS FOR ENVIRONMENTAL ASSESSMENT Final Report, Apr. 1977 - Feb. 1978
Eugene A. Burns 1978 237 p Symp. held at Atlanta, 13-15 Feb. 1978
(Contract EPA-68-02-2165)
(PB-290331/8; EPA-600/7-78-168) Avail: NTIS HC A11/MF A01 CSCL 13B

The 26 presentations made at the Symposium are documented. The objective of the symposium was to bring together people who were responsible for planning and implementing sampling and analysis programs for multimedia environmental assessment. The program consisted of sessions defining the uses of environmental assessment data, the techniques for acquiring information, and recent user field experience with environmental assessment measurement programs. GRA

N79-21646# General Accounting Office, Washington, D. C. Community and Economic Development Div.
IMPROVEMENT NEEDED IN CONTROLLING MAJOR AIR POLLUTION SOURCES
Jan. 1979 25 p
(PB-290242/7; CED-78-165) Avail: NTIS HC A02/MF A01 CSCL 13B

According to the Environmental Protection Agency, 92 percent of the major stationary air pollution sources are complying with emission standards or cleanup schedules. The Agency's data, however, is highly inaccurate. GAO estimates that the actual rate is considerably less than 92 percent. In addition, sources not in compliance are the largest polluters. Enforcement actions by the Agency and States take a long time and are often ineffective. GRA

N79-21647# Colorado State Univ., Fort Collins. Water Resources Research Inst.
POLLUTIONAL CHARACTERISTICS OF STORMWATER RUNOFF Completion Report
Edwin R. Bennett and K. Daniel Linstedt Sep. 1978 226 p refs
(Contracts DI-14-34-0001-6006; DI-14-34-0001-7011; DI-14-34-0001-7012; DI-14-34-0001-8006; OWRT Proj. A-028-COLO)
(PB-290309/4; COMPLETION-84; W79-02451) Avail: NTIS HC A11/MF A01 CSCL 13B

The pollutional characteristics of stormwater runoff were evaluated by sampling stormsewer discharges at three locations. The study was made in Boulder, Colorado and the emphasis was placed on the characteristics of snowmelt runoff. The runoff from three types of land use areas were studied. The sampling locations included a stormsewer outfall for an urbanized residential area with a population density of 25 persons per acre (62 persons per hectare); the outfall of the stormsewer serving a suburban area with a density of 12 persons per acre (30 persons per hectare) and the runoff from an uninhabited, unsewered mountain watershed. The results showed that pollution snowmelt is released more slowly than rain runoff to receiving stream and therefore the maximum concentrations were lower than those for rainfall. GRA

N79-21648# Radian Corp., Austin, Tex.
ASSESSMENT OF THE NEED FOR NOx FLUE GAS TREATMENT TECHNOLOGY Final Report, Mar. 1977 - Oct. 1978
W. E. Corbett, G. D. Jones, W. C. Micheletti, R. M. Wells, and G. E. Wilkins Nov. 1978 111 p refs
(Contract EPA-68-02-2608)
(PB-290201/3; EPA-600/7-78-215) Avail: NTIS HC A06/MF A01 CSCL 13B

Results of a study to determine if and when the application of NOx flue gas treatment (FGT) technology will be necessary in the U.S. are presented. Factors that will influence the levels of NOx emission control needed to comply with both existing and future NOx standards are given. Topics treated include NOx emission sources, atmospheric transport and reactions, air quality

trends, regulations, and control strategies, and FGT methods. It is concluded that the number of air quality control regions (AQCRs) with NOx compliance problems can be expected to increase significantly in the next decade. It further concludes that progressively larger reductions in NOx emissions will be required in order to attain and maintain compliance in 'problem' AQCRs. However, current trends indicate that FGT may be necessary in the future to achieve compliance with NOx standards in certain AQCRs. This conclusion follows from the regionally specific nature of U.S. NOx compliance problems, as well as uncertainties concerning both future NOx emission reduction requirements and the ultimate effectiveness of alternative NOx control methods, such as combustion modification. GRA

N79-21649# Environmental Protection Agency, Ann Arbor, Mich. Standards Development and Support Branch.
EFFECT OF ALTITUDE ON NON-CONTROLLED EVAPORATIVE EMISSIONS FROM GASOLINE-FUELED VEHICLES
Michael W. Leiferman Jan. 1979 9 p refs
(PB-289934/2; SDSB-79/01) Avail: NTIS HC A02/MF A01 CSCL 13B

In response to the renewed interest in control of evaporative emissions at high altitude, the difference in noncontrolled evaporative emissions between locations near sea-level and those in high altitude areas are discussed. Determination of this difference in emissions will result in the identification of control standards for high altitude which gives similar percent reductions as standards in effect for low altitude areas. Mathematical models developed for the prediction of evaporative losses are described. GRA

N79-21650# Washington Univ., Seattle.
VISIBILITY PROTECTION FOR CLASS 1 AREAS: THE TECHNICAL BASIS Final Report
Robert J. Charlson, Alan P. Waggoner, and John F. Thiekle Aug. 1978 117 p refs
(Contract EQ7AD498)
(PB-288842/8) Avail: NTIS HC A06/MF A01 CSCL 13B

Topics considered include: explanation of visibility impairment with emphasis on the distinction between natural visibility degradation and the effects of human activity-induced pollutants; relation of physical and chemical measurements of visual air quality with human perception of impaired visibility; survey of methods for assessing visual air quality; proposed tentative citerion for visual air quality as a basis for regulatory action; and identification of data gaps. GRA

N79-21651# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
GUIDELINE ON AIR QUALITY MODELS
Apr. 1978 91 p refs
(PB-288783/4; EPA-450/2-78-027; OAQPS-1.2-080) Avail: NTIS HC A05/MF A01 CSCL 13B

The guideline recommends air quality modeling techniques that may be applied to air pollution control strategy evaluations and new source reviews, including prevention of significant deterioration. It is intended for use by EPA Regional Offices in judging the adequacy of modeling analyses performed by EPA, by State and local agencies, and by industry and its consultants. It also identifies modeling techniques and data bases that EPA considers acceptable. The guideline makes specific recommendations concerning air quality models, data bases, and general requirements for concentration estimates. GRA

N79-21652# Geological Survey, Corpus Christi, Tex.
ENVIRONMENTAL STUDIES, SOUTH TEXAS OUTER CONTINENTAL SHELF, 1977: GEOLOGY Final Report
Henry L. Berryhill, Jr., ed., Gerald L. Shideler, Steven S. Barnes, Cynthia A. Rice, Charles W. Holmes, and E. Ann Martin 1 Feb. 1978 321 p refs
(PB-289144/8; USGS/GD-78/012) Avail: NTIS HC A14/MF A01 CSCL 08G

The area studied covers 19,250 sq km (7,400 sq mi) and extends northward from the International Boundary to the northern end of Matagorda Island, Texas, and seaward from the Federal-State territorial boundary 16.6 km (10.3 mi) offshore to the outer edge of the continental shelf. Geological results include: the general geologic framework of the continental terrace to a subseafloor depth of approximately 300 m; the structural evaluation of the OCS during late Pleistocene and Holocene times; the distribution and thickness of the Holocene sequence; the stratigraphy of shallow subsurface Holocene sediments with the textural distribution and sedimentation patterns of surficial bottom sediments; trace metals, organic carbon and carbonate content of surficial bottom sediments; trace metals content and mineralogy of suspended sediments; and sea-floor stability with emphasis on the chronology of faulting and sea floor slumping during late Pleistocene and Holocene times. GRA

N79-21653# Environmental Sciences Research Lab., Research Triangle Park, N.C.
A PILOT STUDY ON DISPERSION NEAR ROADWAYS
William B. Petersen Aug. 1978 33 p refs
(PB-289451/7; EPA-600/4-78-044) Avail: NTIS HC A03/MF A01 CSCL 13B

High frequency wind fluctuation data were used to estimate the dispersion near roadways. The standard deviations of the wind direction and the elevation angle were computed for six averaging times. The EPA HIWAY model was modified to use these fluctuation statistics directly to estimate dispersion. The data from the General Motors Sulfate Dispersion Experiment were used in this study. In particular, the data used in this pilot study were three half-hour periods when the winds were nearly parallel with the test track. Results from analysis show that model performance was improved for parallel wind conditions when the fluctuation statistics of the wind were used to estimate dispersion. The results also show that model estimates are most sensitive to the vertical dispersion parameter. Concentrations seem to be insensitive to the horizontal dispersion parameter. GRA

N79-21654# NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
AIR POLLUTION EMISSIONS PROJECTING: A REPORT OF THE NATO/CCMS PILOT STUDY ON AIR POLLUTION ASSESSMENT METHODOLOGY AND MODELING
Oct. 1978 76 p
(PB-289378/2; NATO/CCMS-100) Avail: NTIS HC A05/MF A01 CSCL 13B

The investigation is concerned with alternative emission projection techniques and describes the relationship of emissions projecting to the Air Quality Management System (AQM). Based on the experience of several NATO countries, principles are given for applying the projecting techniques to the available emissions inventory data bases and to the other data required. The appendix presents detailed methodology for emissions projecting in the Federal Republic of Germany and in the United States. GRA

N79-21655# Oregon State Univ., Corvallis. School of Oceanography.
PROCEDURES FOR QUANTITATIVE ECOLOGICAL ASSESSMENTS IN INTERTIDAL ENVIRONMENTS Final Report
J. J. Gonor and P. F. Kemp Sep. 1978 113 p refs
(Grant EPA-R-805018-01)
(PB-289816/1; EPA-600/3-78-087) Avail: NTIS HC A06/MF A01 CSCL 13B

The report is an effort to assemble the best available published procedures for quantitative ecological studies in marine intertidal benthic environments, applicable to evaluating existing or potential pollution effects. Considerable material on how to rigorously devise sampling programs is included. Methods and procedures recommended are synthetic and compiled from a variety of sources. Guidelines are intended for application in marine intertidal ecological impact assessments, pre-and post-pollution baseline surveys and long term monitoring programs intended for the detection and forecasting of potential and human impacts in the intertidal. GRA

N79-21656# Montana State Univ., Bozeman. Water Resources Research Center.
HYDROLOGIC CHARACTERISTICS OF COAL-MINE SPOILS, SOUTHEASTERN MONTANA Final Report
Wayne A. VanVoast, Robert B. Hedges, and John J. McDermott Jun. 1978 39 p refs Prepared in cooperation with Montana Coll. of Mineral Sci. and Technol., Butte and Montana Bureau

of Mines and Geology, Butte
(Contract DI-14-31-0001-4026)
(PB-289223/0; MUJWRRC-94) Avail: NTIS
HC A03/MF A01 CSCL 13B

Coal beds provide water as well as energy because of their generally fractured character. Hydraulic conductivities of saturated spoils are more diverse than those of the undisturbed coal beds but have comparable average values. Aquifer development in mine spoils is greatest near the bases of the spoils where coarse rubble and wasted coal accumlate. Median concentrations of dissolved solids (major constituents) and of some trace elements are higher in waters from mine spoils than in waters from coal beds. The potential for increased dissolved solids is considered the most significant. GRA

N79-21657# Carnegie-Mellon Univ., Pittsburgh, Pa.
ELECTROSTATIC EFFECTS IN FABRIC FILTRATION: VOLUME 1: FIELDS, FABRICS AND PARTICLES (ANNOTATED DATA) Final Report, Sep. 1973 - May 1978
Gaylord W. Penney Jul. 1978 101 p refs
(Grant EPA-R-803020)
(PB-288576/2; EPA-600/7-78-142A) Avail: NTIS
HC A06/MF A01 CSCL 13K

The effect of particle charge and electric fields on the filtration of dust by fabrics is determined. Both frictional charging and charging by corona are studied. Charged particles and an electric field driving particles toward the fabric can greatly reduce the initial pressure drop and also give some reduction in the steady state pressure drop. Collection efficiency is also increased. Frictional charging is unusally erratic and corona charging limted by dust resistivity. In long term or equilibrium conditions, nodular deposits attached to fibers may be of major importance. These nodular deposits may act like check valves, giving a high pressure drop in the forward (filtering) direction, and a low pressure drop in the reverse (cleaning) direction. Thus, these nodules are difficult to remove by reverse air flow. These nodular deposits, as well as electrostatic fields between adjacent fibers of a filter, appear to be electrostatic. GRA

N79-21658# Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
DEVELOPMENT OF A RECOMMENDED SYSTEM FOR DETERMINING NPDES METHOD EQUIVALENCY Final Report
R. J. Fulk, K. R. Huibregtse, N. Kobriger, R. Wullschleger, and J. E. Kane Dec. 1978 143 p refs
(Contract EPA-68-63-2595)
(PB-289410/3; EPA-600/4-78-065) Avail: NTIS
HC A07/MF A01 CSCL 13B

Environmental Protection Agency was mandated by PL 92-500 to establish a National Pollutant Discharge Elimination System (NPDES) which involves specification of approved test procedures. This was ammended to include provisions allowing the use of alternate procedures. Both nationwide and limited use (specific permit holder) variances are involved. The recommended protocol for nationwide variance evaluation included sampling of five industrial effluent categories and possibly one municipal effluent. Six samples would be collected and analyzed in duplicate by both the proposed and approved analytical methods. Data evaluation would include a Moments test for normality followed by transformation, if required. The method comparison would involve a pared t-test and regression on the sample means. Data should be analyzed by industrial category and all together in order to identify if the method comparability was limited to certain discharges. GRA

N79-21659# Pennsylvania State Univ., University Park.
SELECT RESEARCH GROUP IN AIR POLLUTION METEOROLOGY Annual Progress Report, Oct. 1974 - Oct. 1976
R. A. Anthes Aug. 1978 232 p refs
(Grant EPA-R-800397)
(PB-289806/2; EPA-600/4-78-049) Avail: NTIS
HC A11/MF A01 CSCL 04B

Individual investigators, who have conducted different but related meteorological research, present in-depth technical reviews of their work. Prime conclusions are that (1) a scale analysis shows that different models are necessary for meteorological processes on urban, regional and global scales; (2) for high resolution models of the nocturnal planetary boundary layer, K theory models are very efficient, realistic and useful; (3) the mixing height has a significant effect on climatology models; (4) second moment closure methods are useful for convective situations, properly testing counter gradient fluxes; (5) natural sources and pollutants acting at the surface of the earth are important for air quality simulation models; and (6) a combination of conventional micrometeorological and acoustic sounder techniques are sufficient for verifying locally applied inversion use, box, and regional scale models, and urban and regional models require a variety of in situ and remote observation. GRA

N79-21660# SRI International Corp., Menlo Park, Calif. Atmospheric Sciences Lab.
GLOBAL DISTRIBUTION OF SELECTED HALOCARBONS, HYDROCARBONS, SEG, AND N2O Interim Report, Jul. 1977 - Mar. 1978
Hanwant B. Singh, L. J. Salas, H. Shigeishi, and E. Scribner Dec. 1978 81 p refs
(Grant EPA-R-8038020-02)
(PB-289925/0; EPA-600/3-78-100) Avail: NTIS
HC A05/MF A01 CSCL 04A

Northern and Southern hemispheric distributions of halogenated species, hydrocarbons, SF6, and N2O are presented. The atmospheric growth rates of selected halocarbons and N20 are characterized. The fluorocarbon 11 and 12 global burden and hemispheric distribution is consistent with the view that no significant sinks in the troposphere exist. The north-south gradients of fluorocarbon 11, 12, 113, 114, CC14, and SF6 suggest rapid global mixing with an interhemispheric exchange rate of about one year. Within each hemisphere, these species are well mixed. N20 shows the least variations around the globe. The global distribution of CH3CC13 is found to be complex and suggests higher HO levels in the southern hemisphere and around the equator, when compared to the northern hemispheric HO levels. The global distribution of CH3C1 is almost uniform and a significant natural source has been identified in the ocean. It is also shown that large anthropogenic primary or secondary sources of CH3C1 and CC14 exist. Species such as CHC13, Ch2C12, Ch2C13, and C2C14 show very large north-south gradients. The atmospheric growth of fluorocarbons 11, 12, CH3CC13, and CC14 appear to be consistent with the emissions of these constituents. GRA

N79-21661# TRW, Inc., Durham, N. C.
EVALUATION OF DRY SORBENTS AND FABRIC FILTRATION FOR FGD (FLUE GAS DESULFURIZATION) Final Task Report, Mar. 1976 - Oct. 1978
S. J. Lutz, R. C. Christman, B. C. McCoy, S. W. Mulligan, and K. M. Slimak Jan. 1979 155 p refs
(Contract EPA-68-02-2165)
(PB-289921/9; EPA-600/7-79-005) Avail: NTIS
HC A08/MF A01 CSCL 07A

The use of baghouses (fabric filtration) to control air pollutant emissions (particularly sulfur oxides) from large utility combustion sources was assessed. Sorbent costs, and system capital, operating, and disposal costs were determined. Sulfur dioxide would be removed by introducing powdered dry sorbent into the gas stream by precoating the baghouse fabric with sorbent. Whether the apparent economic advantage exhibited by the concept would remain intact after independent third-party evaluation, and if the economic (and other) advantages are sufficiently large to warrant further development of the process at field installations were evaluated. Results show that the dry sorbent baghouse FGD process exhibits an economic advantage when compared with current lime and limestone scrubbing technology when applied to Western power plants burning low sulfur coal. GRA

N79-21662# Radian Corp., Austin, Tex.
ENVIRONMENTAL ASSESSMENT: SOURCE TEST AND EVALUATION REPORT, CHAPMAN LOW-Btu GASIFICATION Final Task Report, Sep. 1977 - Sep. 1978
Gordon C. Page Oct. 1978 257 p refs
(Contract EPA-68-02-2147)
(PB-289940/9; EPA-600/7-78-202) Avail: NTIS
HC A12/MF A01 CSCL 07A

The results of a source test and evaluation of a commercial

Chapman low-Btu gasification facility are reported. The multimedia waste streams and potential fugitive emission and effluent streams from the facility were characterized. The applicability of Level 1 sampling and analytical methodology to such a characterization was evaluated. The particulate removal efficiency of the product gas cyclone was performed. Chemical and biological tests indicated that all multimedia waste and process streams examined contained potentially harmful organic and/or inorganic materials. The product gas cyclone was approximately 60% effective in removing particulate matter from the raw product gas stream. GRA

N79-21663# Chuo Univ., Tokyo (Japan).
SO2 ABATEMENT FOR STATIONARY SOURCES IN JAPAN Final Report, Sep. 1977 - Oct. 1978
Jumpei Ando, Teresa Sipes, ed., and Gary D. Jones, ed. Nov. 1978 331 p refs Prepared in cooperation with Radian Corp., Austin, Tex.
(Contract EPA-68-02-2161)
(PB-290198/1; EPA-600/7-78-210) Avail: NTIS
HC A15/MF A01 CSCL 07A

Results are presented for a study of Japanese government efforts to regulate SOx emissions: the efforts were prompted by serious air pollution problems in Japan during the 1960's. Several technologies are being developed including production of low sulfur gas from coal, fuel desulfurization, and fluidized bed combustion. However, predominant methods currently used for SO2 control in Japan are burning low sulfur fuels and flue gas desulfurization (FGD). Development and application of FGD technology in Japan has preceded similar development in other countries, resulting in a significant reduction in ambient SO2 levels. The stringent daily average ambient standard of 0.014 ppm has almost been achieved. Several types of FGD systems are currently in use in Japan, including wet lime/limestone, indirect and modified lime/limestone, regenerable, and simultaneous NOx/SOx. These processes have been operated satisfactorily on a commercial scale. Both SO2 removal and operability are typically over 90%. Removals and operabilities of 98-99% can be achieved at high costs. GRA

N79-21664# Boyle Engineering Corp., San Diego, Calif.
EVALUATION OF TECHNICAL MATERIAL AND INFORMATION FOR POTENTIAL DESALTING DEMONSTRATION PLANTS Final Report
D. H. Furukawa, K. F. Frank, R. E. Mannion, E. Papadopoulos, and T. C. Ryan Dec. 1978 210 p refs
(Contract DI-14-34-0001-8705)
(PB-290338/3; OWRT/S-79/1) Avail: NTIS
HC A10/MF A01 CSCL 07A

An evaluation was conducted of technical information and material provided by applicants to the OWRT Desalting Demonstration Plant Program. The program was authorized by Public Laws 95-84 and 95-467 to demonstrate the state-of-the-art in desalting technology. The evaluation was conducted based on eight criteria: interest and commitment; general site considerations; consideration of desalting needs; demographic and socio-economic considerations; water supply considerations; financial considerations; energy considerations; and environmental considerations. Thirty-seven sites were evaluated. The applicant sites represent 17 states and the Virgin Islands, and have a variety of water problems which were grouped into 5 categories: inland brackish groundwater; seacoast; island; waterwater for secondary reuse; and wastewater for potable use. The sites were ranked by raw cumulative score and by individual category. Sites with critical water needs were identified in both small and large cities. Each of the sites evaluated represents a genuine potential site for a desalting demonstration plant. GRA

N79-21665# Environmental Protection Agency, Washington, D. C. Office of Toxic Substances.
THE IMPACT OF INORGANIC PHOSPHATES IN THE ENVIRONMENT Final Report
Justine L. Welch Nov. 1978 94 p refs
(PB-291332/5; EPA-560/1-78-003) Avail: NTIS
HC A05/MF A01 CSCL 13B

Literature is reviewed concerning the consquences of nutrient enrichment, the significance of phosphorus in eutrophication, critical phosphorus concentrations, the effects of eutrophication on human populations, and the extent of the eutrophication problem in the United States. GRA

N79-21666# Environmental Protection Agency, Corvallis, Oreg. National Eutrophication Survey.
A COMPENDIUM OF LAKE AND RESERVOIR DATA COLLECTED BY THE NATIONAL EUTROPHICATION SURVEY IN EASTERN NORTH-CENTRAL, AND SOUTH-EASTERN UNITED STATES
Sep. 1978 270 p
(PB-289820/3; Working-Paper-475) Avail: NTIS
HC A12/MF A01 CSCL 13B

Morphometric, limnological, and nutrient loading data are summarized for 153 lakes and reservoirs studied during 1973 - 1974 by the U.S. Environmantal Protection Agency's National Eutrophication Survey. The water bodies for which data are summarized are located in the states of Alabama, Delaware, Florida, Georgia, Illinois, Indiana, Kentucky, Maryland, Mississippi, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia. GRA

N79-21667# Acurex Corp., Mountain View, Calif.
HIGH-TEMPERATURE, HIGH-PRESSURE PARTICULATE CONTROL WITH CERAMIC BAG FILTERS Final Report, Aug. 1976 - Aug. 1978
M. A. Shackleton Oct. 1978 78 p
(Contract EPA-68-02-2169)
(PB-290104/9; EPA-600/7-78-194) Avail: NTIS
HC A05/MF A01 CSCL 13K

Results of bench-scale research indicating that fine particle control at high temperature and pressure can be achieved using barrier filtration by ceramic bag filters are given. Evidence supporting this contention includes: (1) 'blanket' ceramic fiber materials (felts) consisting of small diameter fibers (3.0 micrometers) appear to be the most promising materials for high-temperature and pressure applications because of their combination of good filtration performance and relatively high strength; and (2) accelerated media cleaning tests at high temperatures and pressures show that several ceramic filter structures are capable of surviving in excess of 50,000 cleaning pulses while maintaining pressure drop at acceptable levels. GRA

N79-21668# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
SAMPLING SYSTEM EVALUATION FOR HIGH-TEMPERATURE, HIGH PRESSURE PROCESSES Final Report, Mar. 1976 - Jul. 1977
William Masters, Robert Larkin, Larry Cooper, and Craig Fong Aug. 1978 113 p refs
(Contract EPA-68-02-2153)
(PB-290106/4; EPA-600/7-78-158) Avail: NTIS
HC A06/MF A01 CSCL 14B

A sampling system designed for the high temperatures and high pressures found in pressurized fluidized-bed combustors (PFBC) is described. Two series of tests were run at Exxon's pilot-scale PFBC in Linden, New Jersey; the first was run to measure particulate mass and size distribution (particulate sizing was achieved using a commercial cascade impactor operating at about 105 C); the second was run to determine if condensation occurred between the process temperature of 720 C and the impactor temperature. Results show that cascade impactors can be successfully used for sizing in the high-temperature, high-pressure process stream of the PFBC, and that condensation was not a problem in the tests conducted. GRA

N79-21669# IIT Research Inst., Chicago, Ill.
CALIBRATION STANDARDS FOR X-RAY SPECTROMETERS USED FOR POLLUTION SAMPLE ANALYSIS Final Report, Aug. 1975 - Mar. 1977
Richard A. Semmler and Ronald G. Draftz Sep. 1978 52 p refs
(Contract EPA-68-02-1734)
(PB-291132/9; EPA-600/2-78-197) Avail: NTIS
HC A04/MF A01 CSCL 14B

A technique is described for making aerosol standards for x-ray fluorescence analysis by depositing sized particles suspended in a carrier solution onto the surface of a polycarbonate filter. Size is controlled by a seperate sedimentation step following

grinding in a boron carbide mortar and pestle. Binding of the deposition to the filter is accomplished by a collodion film layer applied both before and after the particle deposition. The deposited mass is determined gravimetrically from a companion filter prepared from a large volume aliquot of carrier solution and without collodion. Standards for 18 different elements were prepared. GRA

N79-21670# Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.
NATIONAL EMISSIONS DATA SYSTEMS (NEDS) FUEL USE REPORT (1975) Final Report
Apr. 1978 130 p
(PB-290162/7; EPA-450/2-78-018) Avail: NTIS HC A07/MF A01 CSCL 21D

This report summarizes annual estimates of total consumption of major fuels such as coal, fuel oil, natural gas, gasoline, and diesel fuel. Estimates of the consumption of a number of other comparatively minor fuels are also included. The data are distributed according to major categories of air pollutant emissions sources and are reported for the nation as a whole and for individual states, territories, and the District of Columbia. GRA

N79-21671# Hittman Associates, Inc., Columbia, Md.
AIR QUALITY IMPACTS USING SRC VERSUS CONVENTIONAL COAL IN POWER PLANTS Final Report, Nov. 1977 - Sep. 1978
Irving Leichter, R. C. Koch, N. L. Nagda, and J. L. Swift Oct. 1978 356 p refs
(Contract EPA-68-02-2162)
(PB-290237/7; EPA-600/7-78-023) Avail: NTIS HC A16/MF A01 CSCL 13B

The results of air quality modeling to assess the impact of burning solvent-refined coal (SRC) instead of conventional coal in three power plants which exceeded National Ambient Air Quality Standards when burning conventional coal are discussed. The EPA CRSTER Gaussian plume model with minor modifications was used to calculate ambient air pollution concentrations (for SO2, NOx, and particulates) when (1) conventional coal and (2) SRC were burned. SRC test burn emissions data were used to determine emission factors for the three pollutants when burning SRC at each plant. The most signification impact of switching from conventional coal to SRC was the reduction of SO2 and particulate concentrations at each plant. The highest 20 maximum 24-hour SO2 concentrations were reduced by 60-75%. GRA

N79-21672# Geological Survey, Bay Saint Louis, Miss. Gulf Coast Hydroscience Center.
DETERMINATION OF ACETONE AND METHYL ETHYL KETONE IN WATER Final Report
Doreen Y. Tai Oct. 1978 44 p refs
(PB-291151/9; USGS/WRD/WRI-79/002; USGS/WRI-78/123) Avail: NTIS HC A03/MF A01 CSCL 07D

Analytical procedures for the determination of acetone and methyl ethyl ketone in water samples were developed. Concentrations in the milligram-per-liter range were determined by injecting an aqueous sample into the analysis system through an injection port, trapping the organics on Tenax-GC at room temperature, and thermally desorbing the organics into a gas chromatograph with a flame ionization detector for analysis. Concentrations in the microgram-per-liter range were determined by sweeping the headspace vapors over a water sample at 50C, trapping on Tenax-GC, and thermally desorbing the organics into the gas chromatograph. The precision for two operators of the milligram-per-liter concentration procedure, expressed as the coefficient of variation, was generally less than 2 percent for concentrations ranging from 16 to 160 milligrams per liter. The precision from two operators of the microgram-per-liter concentration procedure was between 2 and 4 percent for concentrations of 20 and 60 micrograms per liter. GRA

N79-21673# Farleigh Dickinson Univ., Teaneck, N. J. Coll. of Science and Engineering.
DESALINATION TECHNOLOGY TRANSFER CENTER Final Report
R. Bakish 31 Aug. 1978 22 p refs
(Contract DI-14-34-0001-7704)
(PB-291478/6; W79-02840; OWRT-T-0018(7704)(1)) Avail: NTIS HC A02/MF A01 CSCL 07A

A Desalination Technology Transfer Center was established at the West Indies Laboratory of Fairleigh Dickinson University. Surplus equipment from OWRT's facilities in Wilmington, N.C. was moved to St. Croix and installed in specially constructed 30- by 60-ft partially roofed concrete pad. Water intake to feed the system was installed as was a new power supply line to serve the system. In addition, a complete pretreatment train was placed in service suitable for use in demonstration, research and development. The system has the capability of feeding up to four 1500 gpd RO modules. At time of completion of the contract, the system was capable of feeding the RO modules with water with silting density index lower than 3. GRA

N79-21674# Environmental Monitoring and Support Lab., Las Vegas, Nev.
GROUND-BASED SULFUR DIOXIDE MEASUREMENTS WITHIN A COPPER SMELTER PLUME: ANACONDA, MONTANA Final Report, Oct. 1976 - Mar. 1977
J. Jeffrey VanEe Sep. 1978 87 p refs
(PB-290320/1; EPA-600/4-78-055) Avail: NTIS HC A05/MF A01 CSCL 04A

The Monitoring Operations Division (MOD) of the Environmental Monitoring and Support Laboratory - Las Vegas developed a mobile sulfur dioxide (SO2) instrument package for use in the remote, rugged terrain surrounding The Anaconda Company's copper smelter at Anaconda, Montana. The self-contained instrument package was used to obtain ground-level SO2 measurements in the area impacted by the smelter plume. Wind speeds, wind direction, and temperature were recorded at the sampling site. The requirement for the package to be quickly deployed in an area impacted by the smelter plume necessitated the use of a helicopter to sling-load the package into position. Source emission strength estimates, obtained by EPA-Region 8 are presented for those times when SO2 was measured at a site. GRA

N79-21675# Environmental Monitoring and Support Lab., Las Vegas, Nev.
AIRBORNE MEASUREMENTS OF A COPPER SMELTER PLUME IN MONTANA. THE ANACONDA COMPANY, ANACONDA, MONTANA Final Report, 1 Oct. - 9 Dec. 1976
Frank G. Johnson, David T. Mage, and Norman J. Cimon Sep. 1978 230 p refs
(PB-290362/3; EPA-600/4-78-054) Avail: NTIS HC A11/MF A01 CSCL 04A

A field study was conducted during October 1 to December 8, 1976 to measure parameters of the effluent plume of The Anaconda Company's copper smelter, Anaconda, Montana. Plume parameters were observed with a helicopter-borne air quality monitoring system. This data report presents plume heights, plume horizontal and vertical dispersion, and plume centerline concentration, and low-altitude sulfur dioxide concentrations over areas of plume impaction. Nephelometer and SO2 data have been adjusted to account for instrument response times. GRA

N79-21676# Connecticut Univ., Storrs.
REPLACEMENT OF METALLIC IMPURITIES FROM WATER BY METAL BEDS M.S. Thesis
Stephen Gareth Wyatt Munro 1978 32 p refs
(Contract DI-14-31-0001-5007)
(PB-290390/4; W79-02603; OWRT-A-063-CONN(1)) Avail: NTIS HC A03/MF A01 CSCL 07D

The use of metallic replacement reactions for noble metallic ion control was shown to be a realistic prospect. Static granular zinc beds were ideally efficient in removing the noble metal ions Hg(+2), Cu(+2), Pb(+2) which are a major source of corrosion in aluminum flow systems. Magnesium beds were effective in replacing the less noble ions Co(+2), Cd(+2), Cr(+3), Ni(+2). They also, however, suffer rapid corrosion limiting their economic viability. Aluminum was found to be essentially inert. Since aluminum and zinc form more protective coatings, it may be found that an Mg-Zn or Mg-Al alloy will corrode les. rapidly while still being reactive to less noble ions. The effects of time on the process efficiencies were found to reflect the changing

physical characteristics of static beds. Evidence suggested blockage of the bed by the deposition products effectively reduced the apparent size of the bed. Fluidization of the active metal dramatically improved the time characteristics of the removal efficiency, while still maintaining a high electrochemical efficiency. GRA

N79-21677# Mason and Hanger-Silas Mason Co., Inc., Leonardo, N. J.
PERFORMANCE TESTING OF SELECTED SORBENT BOOMS Final Report, 16-19 Aug. 1977
Gary F. Smith Nov. 1978 38 p refs
(Contract EPA-68-03-0490)
(PB-291278/0; EPA-600/7-78-219) Avail: NTIS HC A03/MF A01 CSCL 13B

Performance tests on three commercially available sorbent booms were conducted at the U.S Environmental Protection Agency's Oil and Hazardous Materials Simulated Environmental Test Tank test facility. Test variables included wave condition, tow speed, and quantity of oil encountered. The maximum no-oil-loss containment two speed was determined for each wave and oil quantity test condition. The no-oil-loss low speed in calm water was consistently near 0.25 m/s, but in a 0.3-m harbor chop wave, this figure decreased to between 0.05 and 0.1 m/s. In the 0.3-m harbor chop wave, the failure mode was typically droplet shedding from the contained oil slick, whereas in calm water, the oil slick passed under the booms. No sorbed oil appeared to wash out of the booms when they were towed. When saturated boom sections were wrung out, the recovered fluid weighed from 9.5 to 14 times boom dry weight and was 16 to 50 percent oil. GRA

N79-21678# Science Applications, Inc., La Jolla, Calif.
SOUTHERN CALIFORNIA BASELINE STUDY AND ANALYSIS, 1975-1976. VOLUME 1: EXECUTIVE SUMMARY. VOLUME 2: INTERGRATED SUMMARY REPORT Final Report
Richard A. Callahan and Robert Shokes Mar. 1978 492 p refs
(Contract DI-08550-CT5-52)
(PB-290739/2; BLM/YN/SR-78/05-Vol-1/2-1) Avail: NTIS HC A21/MF A01 CSCL 13B

The purpose of this study was to determine existing levels of petroleum hydrocarbons and trace metals associated with OCS development, plus enhancing or establishing the data base of abundance, composition, diversity and general health of the marine flora and fauna of the area. Rocky intertidal, habitats were studied to determine community composition, biogeographical and seasonal variation. Kelp bed distribution and their seasonal variation were delineated for the shallow areas along the mainland coast and around the offshore islands. Sediment and macrobiota samples from intertidal sites were analyzed for selected trace metals and hydrocarbon characteristics; temporal and spatial variations are discussed. The offshore benthic environment was investigated to determine biological community composition, sedimentological characterization, and selected trace metal and hydrocarbon content. Hydrocarbon and trace metals levels were found to be elevated throughout much of the area of this study. Plant and animal communities were also characterized and found to vary substantially in terms of distribution and abundance. GRA

N79-21679# Argonne National Lab., Ill. Environmental Impact Studies Div.
A BIOLOGIST'S MANUAL FOR THE EVALUATION OF IMPACTS OF COAL-FIRED POWER PLANTS ON FISH, WILDLIFE AND THEIR HABITATS
B. G. Lewis, P. C. Chee, R. M. Goldstein, F. C. Kornegay, and D. L. Mabes Aug. 1978 226 p refs
(Contract W-31-109-eng-38)
(PB-291330/9; FWS/OBS-78/75) Avail: NTIS HC A11/MF A01 CSCL 13B

This manual contains generalized summary of the major impacts to biota that are unique to coal-fired power plants. Power plant features and their impacts discussed in the manual include: gaseous and particulate stack emissions, coal slurry pipelines, coal cleaning and storage, limestone preparation and storage liquid effluents, solid wastes, and coal conversion. This manual, in conjunction with the detailed technical report, Impacts of Coal-Fired Power Plants on Fish, Wildlife, and Their Habitats, provides the information biologists need to have effective input to the power plant environment review process. GRA

N79-21680# Cornell Univ., Ithaca, N. Y. Coll. of Engineering.
ENVIRONMENTAL IMPACT STATEMENT PROJECT
Neil Orloff Dec. 1978 37 p refs
(Contracts DI-14-31-0001-5032; DI-14-31-0001-6033)
(PB-291737/5; W79-03041; OWRT-A-056-NY(6)) Avail: NTIS HC A03/MF A01 CSCL 13B

Activities of the Cornell Project on Environmental Impact Statements over the period 1975-1978 are described. The purpose of the project was twofold: to provide assistance to small communities and citizen groups in their review of environmental impact statements; and to develop general guides for the preparation and review of statements, based on the experience gained in these reviews. The organization and administration of the project, its policies, the specific statements analyzed, the reports and publications produced, and the formal and informal assistance provided to government officials are described. GRA

N79-21681# American Society of Civil Engineers, New York. Urban Water Resources Research Council.
URBAN RUNOFF CONTROL PLANNING
Murray B. McPherson Oct. 1978 196 p refs
(PB-291522/1; EPA-600/9-78-035) Avail: NTIS HC A09/MF A01 CSCL 13B

The importance of conjunctive consideration of urban runoff quantity and quality and the need to development a factual basis that will support expected reliability of performance of proposed actions and programs are emphasized. While not intended as a handbook for urban runoff control planning, this report delves into some important technical issues that are often slighted or poorly handled, such as the utilization of simulation. Recognizing that the ultimate test of any plan lies in its implementation, topics are viewed from the perspective and experience of the local government level where implementation takes place. GRA

N79-21682# Wahler (W. A.) and Associates, Palo Alto, Calif.
POLLUTION CONTROL GUIDELINES FOR COAL REFUSE PILES AND SLURRY PONDS Final Report, Dec. 1975 - Jul. 1977
Nov. 1978 228 p refs
(Contracts EPA-68-03-2344; EPA-68-03-2431)
(PB-291369/7; EPA-600/7-78-222) Avail: NTIS HC A11/MF A01 CSCL 08I

A large percentage of the eastern coal mined today is washed and processed to remove impurities and increase quality. The wastes from the preparation process pose a serious disposal problem. Acid and heavy refuse piles, suspended solids in waters from refuse areas and slurry ponds, noxious gases from oxidation and fires in refuse piles, and airborne particulates from dry exposed refuse surfaces were investigated. GRA

N79-21683# Montana State Univ., Bozeman. Water Resources Research Center.
PREDICTED TRACE METAL CONCENTRATIONS IN SALINE SEEP WATERS Completion Report
Gordon K. Pagenkopf Nov. 1978 25 p refs
(Contract DI-14-34-0001-8028; OWRT Proj. A-110-MONT(1))
(PB-291723/5; MUJWRRC-99; W79-03309) Avail: NTIS HC A02/MF A01 CSCL 08H

Saline seep waters are often observed to contain concentrations of trace metals that are higher than those commonly encountered in non-polluted surface waters. These waters also contain extremely high concentrations of sodium, magnesium and sulfate. An equilibrium model was developed that predicts the concentrations of aluminum, cadmium, cobalt, copper, nickel, lead, and zinc in the saline seep waters. Ionic activity coefficients are calculated from major component analyses data. Best agreement between calculated and observed concentrations of trace metals is obtained for aluminum, copper, and lead. Agreement for cadmium and nickel is good provided the pH values are above eight. The solutions appear to be super saturated with respect to cobalt carbonate. Agreement for zinc is good for some samples but poor for others. GRA

N79-21684# Monsanto Research Corp., Dayton, Ohio.
SOURCE ASSESSMENT: TRANSPORT OF SAND AND GRAVEL Final Report, Aug. 1974 - Sep. 1977
J. C. Ochsner, P. K. Chalekode, and T. R. Blackwood Oct. 1978 63 p refs
(Contract EPA-68-02-1874)
(PB-289788/2; MRC-DA-721; EPA-600/2-78-004Y) Avail: NTIS HC A04/MF A01 CSCL 13B

Atmospheric emissions from the transport of sand and gravel on unpaved roads are described. The potential environmental effect of this emission source was evaluated using source severity, defined as the ratio of the time-averaged maximum ground level concentration of a pollutant at a representative plant boundary to a hazard factor. The hazard factor is the ambient air quality standard for criteria pollutants and an adjusted threshold limit value for noncriteria pollutants. A representative sand and gravel plant processes 274 metric tons/hr, with vehicular traffic of 22 vehicles/hr. The average unpaved road length of sand and gravel plants is 2.2 kilometers, and each truck carries an average of 21 metric tons. The uncontrolled particulate emission factor for the industry due to vehicular movement is 87 g/metric ton. The source severities for particulates and free silica-containing particulates are 0.02 and 2.9, respectively. Some plants have effectively used certain control measures, such as application of oil and chemical solutions into the road surface. GRA

N79-21685# Battelle Columbus Labs., Ohio.
INVESTIGATIONS OF NITROGEN OXIDES WITHIN THE PLUME OF AN ISOLATED CITY Final Report
Chester W. Spicer, Darrell W. Joseph, and Gerald F. Ward 21 Jul. 1978 140 p refs Sponsored in part by Coordinating Research Council
(PB-290107/2; CRC-APRAC-CAPA-9-77) Avail: NTIS HC A07/MF A01 CSCL 13B

The program was designed to validate and extend the earlier Battelle field investigations of NOx reactions in a different locale and with improved analytical methods. The program focused principally on determining the rate of NOx transformation within a reacting urban plume. An instrumented twin-engine research aircraft was employed for continuous monitoring and sample collection within and downwind of Phoenix, Arizona. Both gas and aerosol samplers were collected. GRA

N79-21748# Joint Publications Research Service, Arlington, Va.
STRONTIUM-90 AS A FACTOR IN ENVIRONMENTAL POLLUTION
V. I. Ternov, M. A. Vinogradov, N. V. Gurskaya, and N. A. Fedoseyeva *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 60 (JPRS-73135) 2 Apr. 1979 p 33-37 refs Transl. into ENGLISH from Zdravookhr. Beloruss. (Minsk, USSR), no. 1, 1979 p 33-35 (For primary document see N79-21745 12-51)
Copyright. Avail: NTIS HC A04/MF A01

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N79-21686 Brown Univ., Providence, R. I.
MECHANICS OF APPALACHIAN PLATEAU STRUCTURES Ph.D. Thesis
David Vilander Wiltschko 1978 149 p
Avail: Univ. Microfilms Order No. 7906629

The thesis is composed of two projects, both of which deal with the mechanics of Appalachian Plateau structures. The first deals with Plateau folds of the central Appalachians whereas the second concerns the mechanics of thrust-sheet movement in the southern Appalachians. Dissert. Abstr.

N79-21687 California Univ., Los Angeles.
THE GEOMORPHOLOGY OF CLAY SURFACE PLAYAS Ph.D. Thesis
Frank Myers Hanna 1978 499 p
Avail: Univ. Microfilms Order No. 7907657

Playas are arid landforms consisting of fine-grained horizontal sediments in undrained depressions. The geomorphic relations between the playa and its drainage basin in terms of morphology, sedimentology, and lithology are examined. The morphologic data were gathered from measurements of topographic maps and from field surveying, the sediment data from the clastic size analysis of 265 samples collected from the surface and subsurface of the playas and alluvial fans in the basins, and the lithologic data were measured from geologic maps. Of the basin parameters only basin area and playa area are strongly related. Elevation, relative relief and playa area are considerably less related. The basin lithologic composition is unrelated to morphology. Dissert. Abstr.

N79-21688 Saint Louis Univ., Mo.
RUPTURE PROCESSES OF SOME COMPLEX EARTHQUAKES IN SOUTHERN MEXICO Ph.D. Thesis
Jaime Yamamoto 1978 203 p
Avail: Univ. Microfilms Order No. 7908318

A sequence of earthquakes occurred near the coast of Chiapas, Mexico on April 29, 1970. The long-period P waveforms of the three most important events of this sequence were analyzed using synthetic seismograms. Perturbations in the wave forms are shown to be caused by near-source structure and are produced by complexities in the earthquake source time-functions. The results show that the aftershock of April 30 at 0833 (M sub S = 6.4) can be modelled by a simple point source with a seismic moment of 6.6 x 10 to the 25th power dyne-cm. The foreshock of April 29 at 1122 (M sub S = 6.3) consisted of two simple events 7 seconds apart having approximately the same seismic moment of 4.1 x 10 to the 25th power dyne-cm. Four events were identified within the 15 second interval prior to the main rupture (M sub S = 7.3) for which the seismic moment was 9.9 x 10 to the 26th power dyne-cm. Dissert. Abstr.

N79-21689 Michigan Univ., Ann Arbor.
HEAT FLOW AND RADIOGENIC HEAT PRODUCTION IN BRAZIL WITH IMPLICATIONS FOR THERMAL EVOLUTION OF CONTINENTS Ph.D. Thesis
Icaro Vitorello 1978 153 p
Avail: Univ. Microfilms Order No. 7907192

Heat flow and heat production results are reported from nineteen widely spaced sites in eastern and central parts of Brazil. Dissert. Abstr.

N79-21690 Columbia Univ., New York.
SEISMIC AND TECTONIC STUDIES OF PLATE BOUNDARIES: MID-ATLANTIC RIDGE AT 37 DEG N, OCEANOGRAPHER FRACTURE ZONE AND MARGIN OF THE PHILIPPINE SEA PLATE Ph.D. Thesis
Hugh Eaton Rowlett, Jr. 1978 153 p
Avail: Univ. Microfilms Order No. 7908664

Eight seismic refraction lines were shot along different azimuths away from two ocean bottom seismographs located between Deep Sea Drilling Project holes 332 and 333 in the crestal mountains west of the median valley of the mid-Atlantic ridge near 37 deg N. Large variations, 5.6 to 6.6 km/sec, were observed in the apparent velocities from a man refractor that is approximately 1.7 km beneath the seafloor at the receivers. The compressional velocity for the main refractor is about 6.3 km/sec. A study of travel-time residuals of the main refractor from refraction lines perpendicular to the median valley and local structural trends on the sea floor suggests that the block faulting that causes the relief of the sea floor may extend to the depth of the main refractor. Travel-time data from split profiles suggest that the depth of the main refractor in the crestal mountains increases away from the median valley. A structural model is proposed for the mid-Atlantic ridge at 37 degs N. Dissert. Abstr.

N79-21691 California Univ., Los Angeles.
STRONG GROUND MOTION FROM POINT SOURCES Ph.D. Thesis
Peter Jaroslav Hradilek 1978 294 p
Avail: Univ. Microfilms Order No. 7907660

Analytic expressions are obtained for the surface displacements of an idealized layered flat earth produced by elementary point sources. The integral expressions are put into form more tractable to numerical evaluation. The orientation of the fault and slip vectors is factored from the solution, the total displacement field for a given layered system source depth, and epicentral distance is given by a linear superposition of eight modal components. A computer program to calculate the body wave portion of the displacement field is described and a listing provided. Realistic values of the parameters are used in the numerical examples. A measure of finiteness is incorporated into the source by integrating the source time dependence over a hypothetical circular fault. The significance of a few of the approximations and uncertainties inherent to the field of earthquake engineering were examined via parametric variation. The time domain displacements and velocities obtained are plausible and exhibit features similar to recorded motions. Results indicate that the motions are more sensitive to variations at the site, i.e. layering, than to variations at the source, i.e. fault parameters, source depth, and epicentral distance. The incorporation of layering was found to be much more important than the accurate determination of the layer parameters. Dissert. Abstr.

N79-21692 Brown Univ., Providence, R. I.
AN ANALYTICAL INVESTIGATION OF THE MECHANICS OF CONTINENTAL RIFTING Ph.D. Thesis
Martha Oliver Withjack 1978 114 p
Avail: Univ. Microfilms Order No. 7906630

The origin of continental rift systems is poorly understood. Pertinent questions exist involving the cause of lithospheric thinning and crustal uplift, the structural style of rift systems, and whether uplift alone or a combination of crustal uplift and regional horizontal tension produces rifts. This thesis addresses these questions in two separate papers. Dissert. Abstr.

N79-21693 Missouri Univ. - Columbia.
LONG-RANGE VARIATION OF BASIC PARAMETERS IN THE NORTHERN HEMISPHERIC CIRCULATION Ph.D. Thesis
Thomas Robert Heddinghaus 1978 193 p
Avail: Univ. Microfilms Order No. 7906884

A statistical analysis of the long-range variations of basic parameters of the Northern Hemisphere circulation is presented for the period from April, 1955 to December, 1974. Three different methods of analysis are used. First, time variations of single parameters are studied using harmonic analysis. Second, the important spatial and associated temporal coefficients of mutually independent patterns in the parameters are examined, using eigenvector analysis. Finally, the cross-correlations of various pairs of parameters are examined using cross-spectral analysis. Dissert. Abstr.

N79-21694 Iowa State Univ. of Science and Technology, Ames.
TRIAXIAL SHEAR OF SOIL WITH STRESS PATH CONTROL BY PERFORMANCE FEEDBACK Ph.D. Thesis
Charles Hadley Cammack 1978 156 p
Avail: Univ. Microfilms Order No. 7907240

A new stress-path controlled triaxial shear test procedure is presented which realistically models the field stress environment of soils under load and either drained or undrained conditions. The test does not require estimated or previously determined parameters indicative of the soil response to load, and the stress-strain behavior during each period, or cycle, of the test is the only variable. Stress path control is accomplished by increasing the confining pressure periodically as the axial stress increases continuously, on the basis of a scheme developed from theory of elasticity and a mathematical model of soil behavior. Two types of soil behavior are modeled: (1) anisotropic consolidation with zero lateral strain and (2) the application of foundation loads. Tests were conducted within a standard triaxial shear apparatus, and the mathematical scheme for controlling stress path was implemented through a microprocessor based personal computer. Dissert. Abstr.

N79-21695 Texas A&M Univ., College Station.
SUBMARINE GEOMORPHOLOGY AND GEOLOGY OF THE MISSISSIPPI RIVER DELTA FRONT Ph.D. Thesis
Peter Kurt Trabant 1978 131 p
Avail: Univ. Microfilms Order No. 7909243

Integrated high resolution seismic, side scan sonar and engineering borehole data were used towards an interpretation of the shallow seismic stratigraphy and geomorphology of the Mississippi River Delta Front. Three seismic stratigraphic groups revealed the transgressive-regressive depositional sequences associated with Late Pleistocene glacio-eustatic changes in sea level. Each of the stratigraphic groups was found to consist in a lower clayey unit and an upper fine sand and shell unit. Paleotopographic maps of the stratigraphic units reveal the morphology of the former continental shelves. Structural features observed within the delta front area include shelf edge growth faults, a salt diapir and an extensive erosional unconformity which is believed to be the result of a large slide mass of early Holocene age. The modern prodeltaic sedimentary wedge includes up to 100 meters of very soft, highly underconsolidated gas bearing silty clays, deposited during the past 500 years. Dissert. Abstr.

N79-21696*# California Inst. of Tech., Pasadena. Seismological Lab.
CORE FORMATION, EVOLUTION, AND CONVECTION: A GEOPHYSICAL MODEL
Larry Ruff and Don L. Anderson [1978] 59 p refs
(Grant NGL-05-002-069)
(NASA-CR-158457; Contrib-3096) Avail: NTIS HC A04/MF A01 CSCL 08G

A model is proposed for the formation and evolution of the Earth's core which provides an adequate energy source for maintaining the geodynamo. A modified inhomogeneous accretion model is proposed which leads to initial iron and refractory enrichment at the center of the planet. The probable heat source for melting of the core is the decay of Al. The refractory material is emplaced irregularly in the lowermost mantle with uranium and thorium serving as a long lived heat source. Fluid motions in the core are driven by the differential heating from above and the resulting cyclonic motions may be the source of the geodynamo. Author

N79-21697*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WORKSHOP ON THE NEED FOR LIGHTNING OBSERVATIONS FROM SPACE: PRELIMINARY REPORT
Larry S. Christensen, ed., Walter Frost, ed., and William W. Vaughan, ed. Mar. 1979 58 p Workshop held at Tullahoma, Tenn., 13-15 Feb. 1979 Prepared in cooperation with Tennessee Univ. Space Inst., Tullahoma
(NASA-CP-2083) Avail: NTIS HC A04/MF A01 CSCL 04A

A preliminary summary of the Workshop is provided. The motivation for the workshop resulted from the goals and objectives of the Severe Storms and Local Weather Research Program at NASA's Office of Space and Terrestrial Applications and a recent exploratory meeting on atmospheric electricity and storms which was held April 10-11, 1978, at NASA Marshall Space Flight Center, Alabama. The applicable goals and objectives of NASA's Severe Storms and Local Weather Research Program were used to set the primary frame of reference for this report. The text of the overview papers presented at the Workshop are to be included in the final proceedings of the Workshop. G.Y.

N79-21698# Geophysical Observatory, Sodankyla (Finland).
OBSERVATIONS OF THE REFLECTION COEFFICIENT OF THE SPORADIC E-LAYER AT HIGH LATITUDES
T. Turunen, T. Nygren (Oulu Univ.), and L. Jalonen (Oulu Univ.) Finnish Acad. of Sci. and Letters Mar. 1979 21 p refs
(Rept-31) Avail: NTIS HC A02/MF A01

A method to measure the reflection coefficient of the sporadic E-layer using a conventional ionosonde is described, and some results obtained at Sodankylae, Finland (phi = 63.8 deg, delta = 120.0 deg), are presented. The observations are often found to be in the agreement with the theoretical frequency dependence of the reflection coefficient of a thin horizontal layer in the presence of mode coupling. Some of the results can be interpreted as indicative of scattering from small-scale irregularities in the Es-layer. Author

N79-21699*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPLICATIONS OF VERY LONG BASELINE IN-

TERFEROMETRY MEASUREMENTS ON NORTH AMERICAN INTRA-PLATE CRUSTAL DEFORMATION
R. J. Allenby Feb. 1979 24 p refs
(NASA-TM-79725) Avail: NTIS HC A02/MF A01 CSCL 08G

Very Long Baseline Interferometry experiments over the last 1-3/4 years between Owens Valley, CA and Haystack, MA Radio Observatories suggest an upper limit of east-west crustal deformation between the two sites of about 1 cm/yr. In view of the fact that the baseline between the two sites traverses most of the major geological provinces of the United States, this low rate of crustal deformation has direct relevance to intra-plate crustal tectonics. The most active region traversed by this baseline is the Basin and Range province, which was estimated by various researchers to be expanding in an east-west direction at rates of .3 to 1.5 cm/yr. The Colorado Plateau and Rocky Mountain system also appear to be expanding, but at a somewhat lower rate, while east of the Rocky Mountains, the predominant stress appears to be compressional, nearly horizontal, and east to northeast trending. Author

N79-21700# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
A CORRELATION OF THERMOSPHERIC GRAVITY WAVES WITH TROPOSPHERIC LIGHTNING
Y. T. Chiu, B. C. Edgar, C. J. Rice, and L. R. Sharp 15 Jan. 1979 21 p refs
(ATR-79(9553)-5) Avail: NTIS HC A02/MF A01

A geographic correlation is demonstrated between occurrence frequencies of wave-like structures in the thermosphere and tropospheric lightning at dawn, which is an indicator of deep convective activity. Author

N79-21701# Utah State Univ., Logan. Electro-Dynamics Lab.
AIRCRAFT-BORNE INFRARED MEASUREMENTS Final Report, 1 Oct. 1974 - 10 Sep. 1977
Ronald J. Huppi and John H. Schummers 1 Jan. 1978 61 p refs
(Contract F19629-74-C-0190; ARPA Order 2656; DA MIPR A-3168E-37-7W02)
(AD-A062259; EDL-SRL-78-1; AFGL-TR-78-0039) Avail: NTIS HC A04/MF A01 CSCL 04/1

Infrared measurements of natural and induced infrared sources were measured. Measurements included: near infrared atmospheric measurements in an auroral region with radiometers in the 1.7 and 2.8 micrometer region; infrared measurements of aircraft emissions and reflections in the 2.5 to 7.5 micrometer spectral region; and spectral measurements of the airglow emissions produced by fundamental hydroxyl chemiluminescent processes in the upper atmosphere. All measurements were made from AFGL's NKC-135A aircraft. To accomplish these measurements it was necessary to modify, maintain, calibrate, and operate various interferometer and radiometer systems. Processing and reduction of the data were also necessary to allow proper presentation of the measurements in scientific reports. The data reduction techniques were continually improved to efficiently provide the desired graphs and tables. An important advancement was made in the spatial radiometer data reduction process. A system was designed and techniques were developed which enable one to accurately calibrate the spatial data taken with existing AFGL spatial radiometers. Citations are provided to the measured data and significant hardware advances which have been presented in scientific reports and open literature. GRA

N79-21702# Air Force Global Weather Central, Offutt AFB, Nebraska.
POINT ANALYSIS USER'S GUIDE
Paul T. Nipko and Randolph G. Arbeiter 30 Sep. 1978 81 p refs
(AD-A063648; AFGWC-TM-78-003) Avail: NTIS HC A05/MF A01 CSCL 04/2

The new Point Analysis (PA) process was developed to correct specific deficiencies in the previous process (AFGWC) Point Analysis Documentation, 1 Aug. 1974. These deficiencies, identified by the 3d Weather Wing Point Analysis Conference in March of 1976, fall into three general categories. First, the moisture modeling technique had a deficiency of moisture through the tropopause. Second, there was a lack of observed density data for the 80km to 250km region. Finally, the production process required an excessive number of manual tasks. The new PA process employs a new tropopause moisture modeling technique; includes, when available, rocket sonde (ROCOB) observations; and reduces the manual tasks to directing and quality controlling the automated process. Author (GRA)

N79-21703# Texas A&M Univ., College Station. Dept. of Physics.
RADIATIVE TRANSFER IN AN ATMOSPHERE-OCEAN SYSTEM: A MATRIX OPERATOR APPROACH
George W. Kattawar, Terry J. Humphreys, and Gilbert N. Plass 27 Jul. 1978 28 p refs
(Contract N00014-75-C-0537)
(AD-A063652; Rept-13) Avail: NTIS HC A03/MF A01 CSCL 04/1

Air water interactions, Radiative transfer, Mathematical analysis, Matrices Mathematics, Radiance, Rayleigh scattering, Dielectrics, Computations, Transfer functions, Albedo, Mapping Transformations. It is the purpose of this paper to demonstrate how the matrix operator method can be effectively implemented to couple the radiation fields of the atmosphere and ocean. Azimuthally averaged radiances and irradiances are presented as a function of optical depth for a conservative Rayleigh scattering medium of total optical thickness = 1000 with dielectric interface placed at optical depths of 0.01, 0.1, and 10.0, and for various solar incident angles. Author

N79-21704# Ohio State Univ., Columbus. Dept. of Geodetic Science.
A COMPARISON OF BJERHAMMAR'S METHOD AND COLLOCATION IN PHYSICAL GEODESY Interim Report
Lars Sjoeberg Jul. 1978 90 p refs
(Contract F19628-76-C-0010)
(AD-A063194; DGS-273; SR-17; AFGL-TR-78-0203) Avail: NTIS HC A05/MF A01 CSCL 08/5

In 1963 A. Bjerhammar solved the geodetic boundary value problem by applying Poisson's integral equation for a finite set of observed free-air gravity anomalies. Due to the relation between the number of observations (m) and the number of chosen unknowns (N) different solutions are obtained: non-singular (m = N), least squares (m = N) and minimum norm solutions (m = N). In the special case N approaches infinity, it is shown that the Bjerhammar solution with Poisson's kernel and a solution by collocation with the corresponding kernel are identical. Bjerhammar's method is generalized by using other kernel functions, and each minimum norm solution is shown to correspond to one specific set of degree variances in collocation. The impulse approaches (reflexive prediction, Dirac method) of Bjerhammar are presented. In the theoretical case with a continuous coverage of observations at the surface of the earth, it is shown that both the Dirac method and collocation give a unique solution for any choice of positive degree variances of the kernel functions, whenever the solutions exist. However, the intermediate solutions for Delta g star and X at the Bjerhammar sphere do not exist in general. If collocation is applied by solving the Wiener-Hopf integral equation, a convergent solution is proved outside a sphere. However, inside the bounding sphere of the earth the convergence is still not proved. GRA

N79-21705# Stanford Univ., Calif. John A. Blume Earthquake Engineering Center.
FACILITIES MANUAL
Martin W. McCann, Jr. and Russell S. Mills Mar. 1978 40 p refs
(PB-290356/5; NSF/RA-780320) Avail: NTIS HC A03/MF A01 CSCL 08K

The central computer system located in the Data Processing Laboratory of the John A. Blume Earthquake Engineering Center can perform the following functions: (1) Digitization of strong motion accelerograms obtained either from earthquakes or from tests of buildings can be performed. The accelerographs are traced on the digitizing table, which automatically records X and Y coordinates of points on the accelerograms. The coordinates are sent to the main computer, where the earthquake record is analyzed. (2) The computer controls the operation of the dynamic testing equipment and the shake table. The shake table can be vibrated to simulate any past earthquake or postulated future

earthquake. (3) Measurements obtained dynamically from experiments run on the shake table or on the dynamic testing equipment are converted automatically from analog to digital form. The data is stored on disk or magnetic tape for future analysis. Signal generation and data acquisition can operate simultaneously. (4) The computer combined with the disk and magnetic tape allows for large programming capabilities. GRA

N79-21708# Stanford Univ., Calif. John A. Blume Earthquake Engineering Center.

A BAYESIAN APPROACH TO SEISMIC HAZARD MAPPING: DEVELOPMENT OF STABLE DESIGN PARAMETERS

Christian P. Mortgat and Haresh C. Shah Mar. 1978 241 p refs Sponsored in part by Organisme de Controle Technique de La Construction, Algiers (Algeria)

(PB-290374/8; NSF/RA-780321) Avail: NTIS HC A11/MF A01 CSCL 08K

The Bayesian procedure developed and applied as a case study to Nicaragua, has the advantage of combining all the available historical, seismological, and geological information in a rational and consistent way. The mapping parameters considered for this study are the peak ground acceleration and the duration of the strong ground motion. In order to be consistent with the probabilistic approach of the model and to take into consideration the large scatter for attenuation data, probabilistic treatment of the attenuation relationships in the form of coefficient of variation is presented. Comparison is made between the isoacceleration maps developed in this study and previous results. A numerical analysis of 97 accelerograms was studied. Results indicate a better understanding the statistical behavior of input accelerograms and response time histories better design parameters for use by engineers are developed. Various possible applications and uses of the parameters parameters developed are suggested. GRA

N79-21707# National Environmental Satellite Service, Washington, D. C.

THE USE OF INFRARED AND VISIBLE IMAGERY FOR SEA ICE MONITORING

E. Paul McClain 1978 34 p refs Background material for WMO Workshop on Remote Sensing of Sea Ice, Washington, D. C., 16-20 Oct. 1978

(PB-291800/1; NOAA-78121902) Avail: NTIS HC A03/MF A01 CSCL 08J

Global mapping of pack ice conditions and the climatic roles of ice are dealt with along with the presentation of information on visible and infrared observations from spacecraft and aircraft. Historical ice records are identified. GRA

N79-21708# Arizona Univ., Tucson. Dept. of Geosciences.

ANALYSIS OF GRAVITY DATA FROM THE PICACHO BASIN, PINAL COUNTY, ARIZONA M.S. Thesis

Fritz Jay Christie 1978 196 p refs

(Contract DI-14-34-0001-8003)

(PB-290139/5; W79-02599; OWRT-A-073-ARIZ(1)) Avail: NTIS HC A13/MF A01 CSCL 08E

A gravity survey was conducted in the Picacho Basin area, located approximately midway between Phoenix and Tucson, Arizona, to define the bedrock surface configuration. Regional gravity effects were removed from the gravity data using a double Fourier series trend surface technique, and the gravity data were modeled by using a two-dimensional iterative program. Analysis of both the complete Bougkuer and residual gravity anomaly maps indicates that the Picacho Basin is a north-south trending graben-like structure with significant pediment development beneath as much as 2000 feet of alluvium. The maximum basin depth is nearly 15,600 feet. GRA

N79-21709# National Geodetic Survey, Rockville, Md.

SOLVABILITY ANALYSIS OF GEODETIC NETWORKS USING LOGICAL GEOMETRY

Richard A. Snay Oct. 1978 36 p refs

(PB-291286/3; NOAA-TM-NOS-NGS-14; NOAA-78120102) Avail: NTIS HC A03/MF A01 CSCL 08E

A complete solvability analysis of leveling networks can be efficiently performed on the computer without recourse to real number arithmetic. Attempts to generalize this statement to include horizontal networks have been unsuccessful. With leveling networks the solvability analysis relies on a mechanism of identifying solvable subnetworks of a solvable network. A horizontal network can be solvable and yet have no nontrivial solvable subnetworks. GRA

N79-21710# National Technical Information Service, Springfield, Va.

THE CHEMISTRY AND PHYSICS OF OZONE IN THE STRATOSPHERE AND UPPER ATMOSPHERE, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - 1976

Diane M. Cavagnaro Mar. 1979 200 p

(NTIS/PS-79/0072/3) Avail: NTIS HC $28.00/MF $28.00 CSCL 04A

The cited reports of Federally-funded research discuss the chemical reactions and kinetics, particle physics, photochemistry, transport processes, and atmospheric models of ozone in the stratosphere. Analysis and sounding procedures and data are excluded. Included are the effects of supersonic transport aircraft on ozone concentrations. This updated bibliography contains 194 abstracts. GRA

N79-21711# National Technical Information Service, Springfield, Va.

THE CHEMISTRY AND PHYSICS OF OZONE IN THE STRATOSPHERE AND UPPER ATMOSPHERE, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1977 - Feb. 1979

Diane M. Cavagnaro Mar. 1979 155 p Supersedes NTIS/PS-78/0063; NTIS/PS-77/0020; NTIS/PS-76/0029; NTIS/PS-75/228

(NTIS/PS-79/0073/1; NTIS/PS-78/0063; NTIS/PS-77/0020; NTIS/PS-76/0029; NTIS/PS-75/228) Avail: NTIS HC $28.00/MF $28.00 CSCL 04A

The bibliography contains selected abstracts of research reports concerning chemical reactions and kinetics, particle physics, photochemistry, transport processes, and atmospheric models of ozone in the stratosphere. Analysis and sounding procedures and data are excluded. Effects of supersonic transport aircraft exhaust on ozone concentrations are included. This updated bibliography contains 149 abstracts. GRA

N79-21712# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.

STRONG-MOTION EARTHQUAKE INSTRUMENT ARRAYS. PROCEEDINGS OF THE INTERNATIONAL WORKSHOP ON STRONG MOTION EARTHQUAKE INSTRUMENT ARRAYS

W. D. Iwan May 1978 117 p Workshop held at Honolulu, Hawaii, 2-5 May 1978; sponsored by UNESCO

(Grant NSF ENV-77-14726)

(PB-290112/2; EERL-78-04) Avail: NTIS HC A06/MF A01 CSCL 08K

The goal of the Workshop was to develop a workable plan for the possible future deployment of dense strong-motion arrays with primary emphasis on ground motion studies. Topics considered by the workshop included; favorable array locations, the design of arrays for source mechanisms and wave propagation, the design of arrays for local effects studies, array construction and operation, and implementation. GRA

N79-21713# Stanford Univ., Calif. Earthquake Engineering Center.

PROBABILISTIC SITE-DEPENDENT RESPONSE SPECTRA

Anne S. Kiremidjian and Haresh C. Shah Apr. 1978 93 p refs Sponsored in part by Banco Central de Nicaragua

(Grant NSF GI-39122)

(PB-290353/2; NSF/RA-780322) Avail: NTIS HC A05/MF A01 CSCL 08L

Effects of local soil conditions on the PGA (Peak Ground Acceleration), the frequency content, and the amplification factor were investigated. Peak ground motion modification parameters for correcting the probability distribution on the peak ground acceleration values for the site of interest were obtained. Site dependent response spectral shapes (or dynamic amplification factors), probability distributions of the latter for three basic soil types, probability distributions on response spectra at a given location for the three different soil types and from them to

obtain design response spectra for a specified risk level were developed. GRA

N79-21714# Purdue Univ., Lafayette, Ind. Joint Highway Research Project.
THE RELATION BETWEEN PERMEABILITY AND PORE SIZE DISTRIBUTION OF COMPACTED CLAYEY 4 SLITS Interim Report
Ignacio Garcia-Bengochea Apr. 1978 206 p refs Sponsored by Federal Highway Administration and Indiana State Highway Commission
(PB-291982/7; JHRP-78-4) Avail: NTIS HC A10/MF A01 CSCL 08M

The study examines (1) the relation between permeability and pore size distribution, and (2) the influence of varying water content and compaction effort on the soil fabric of compacted fine-grained soils. Three blends of silt and kaolin were compacted at different energy levels and water contents. Falling head tests under back pressure were used to measure permeability. The mercury intrusion technique was used to measure pore size distribution. Freeze drying was used to minimize soil disturbance prior to mercury intrusion. A method of approximating the differential pore size distribution is described which simplifies the interpretation of pore size distributions. The soils tested were found to have a bimodal pore size distribution on a log diameter scale. The permeability generally increased with increasing large pore mode. Empirical predictive equations for permeability based on pore size distribution parameters were determined for each of the soils tested. The pore size parameters used were based on theoretical models which relate permeability to pore size distribution. GRA

N79-21461*# Australian National Univ., Canberra. Research School of Earth Sciences.
PROGRESS IN GEOPHYSICAL ASPECTS OF THE ROTATION OF THE EARTH
Kurt Lambeck *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 1-11 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21462*# Bureau International de l'Heure, Paris (France).
ROTATION OF THE EARTH AND POLAR MOTION, SERVICES
Bernard Guinot *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 13-18 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21463*# Technische Hogeschool, Delft (Netherlands). Dept. of Geodesy.
EARTH ROTATION AND POLAR MOTION FROM LASER RANGING TO THE MOON AND ARTIFICIAL SATELLITES
L. Aardoom *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 19-28 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21464*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
PRINCIPLES OF VERY-LONG-BASELINE INTERFEROMETRY
Irwin I. Shapiro *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 29-33 refs Sponsored in part by NASA and NSF (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21465*# Michigan Univ., Ann Arbor. Dept. of Geology and Mineralogy.
POLAR WANDER ANALYSIS FROM PALEOMAGNETIC DATA
Rob VanderVoo *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 35-37 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21466*# National Aeronautics and Space Administration, Washington, D. C.
PRESENT STATUS AND FUTURE PROSPECTS FOR NASA'S PROGRAM IN GEODYNAMICS
Edward A. Flinn *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 39 (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21468*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MOBILE RADIO INTERFEROMETRIC GEODETIC SYSTEMS
P. F. MacDoran, A. E. Niell, K. M. Ong, G. M. Resch, D. D. Morabito, E. S. Claflin, and T. G. Lockhart *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 47-51 refs (For primary document see N79-21460 12-42)
(Contract NAS7-100)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21469*# Naval Surface Weapons Center, Dahlgren, Va.
APPLICATION OF GLOBAL POSITIONING SYSTEM TO DETERMINATION OF TECTONIC PLATE MOVEMENTS AND CRUSTAL DEFORMATIONS
R. J. Anderle *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp 1978 p 53-57 ref (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21472*# National Geodetic Survey, Rockville, Md.
MONITORING REGIONAL CRUSTAL DEFORMATION WITH HORIZONTAL GEODETIC DATA
R. A. Snay and J. G. Gergen *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 87-92 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21473*# Geological Survey, Menlo Park, Calif.
STRAIN PATTERNS AND STRAIN ACCUMULATION ALONG PLATE MARGINS
J. C. Savage *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 93-97 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21474*# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
MULTIPLE WAVELENGTH GEODESY
Judah Levine *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 99-102 refs (For primary document see N79-21460 12-42)
(Grant NsG-7344)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21475*# Rome Univ. (Italy). Inst. di Fisica.
PROBLEMS AND ADVANCES IN MONITORING HORIZONTAL STRAIN
Michele Caputo *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 103-109 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21476*# Technical Univ., Milan (Italy). Inst. of Surveying.
DETECTION OF HORIZONTAL CRUSTAL MOVEMENTS BY PHOTOGRAMMETRIC METHODS
Luigi Solaini *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 111-112 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21477*# Universidad del Zulia Maracaibo (Venezuela). Escuela de Geodesia.
LOCAL PRECISION NETS FOR MONITORING MOVEMENTS OF FAULTS AND LARGE ENGINEERING STRUCTURES
Heinz G. Henneberg *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 113-130 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21479*# Flinders Univ., Bedford Park (Australia). School of Earth Sciences.
SEA LEVEL DATA AND TECHNIQUES FOR DETECTING VERTICAL CRUSTAL MOVEMENTS
G. W. Lennon *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 137-143 ref (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21480*# New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
MODELLING OF PHYSICAL INFLUENCES IN SEA LEVEL RECORDS FOR VERTICAL CRUSTAL MOVEMENT DETECTION
Edward G. Anderson *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 145-152 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21481*# Geological Survey, Menlo Park, Calif.
THE GRAVITY METHOD AND INTERPRETIVE TECHNIQUES FOR DETECTING VERTICAL CRUSTAL MOVEMENTS
Robert C. Jachens *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 153-155 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21482*# Earth Physics Branch, Ottawa (Ontario). Gravity and Geodynamics Div.
REVIEW OF CANADIAN EXPERIENCE IN PRECISE GRAVIMETRY
Anthony Lambert *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 157-158 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

N79-21483*# Universidad del Zulia Maracaibo (Venezuela). Escuela de Ingenieria Geodesica.
INVESTIGATIONS ON VERTICAL CRUSTAL MOVEMENTS IN THE VENEZUELAN ANDES BY GRAVIMETRIC METHODS
Hermann Drewes *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 159-163 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21484*# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE MEASUREMENT OF LONG PERIOD AND SECULAR DEFORMATION WITH DEEP BOREHOLE TILTMETERS
Gerry H. Cabaniss *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 165-169 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21485*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
APPLICABILITY OF APT AIDED-INERTIAL SYSTEM TO CRUSTAL MOVEMENT MONITORING
J. Arnold Soltz *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 177-182 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21486*# National Geodetic Survey, Rockville, Md.
MODELS FOR EXTRACTING VERTICAL CRUSTAL MOVEMENTS FROM LEVELING DATA
Sandford H. Holdahl *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 183-190 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21487*# Naval Surface Weapons Center, Dahlgren, Va.
GRAVITY FIELD, GEOID AND OCEAN SURFACE BY SPACE TECHNIQUES
Richard J. Anderle *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 193-196 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

N79-21491*# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Astronomische und Physikalische Geodasaesie.
IMPROVEMENTS OF THE GRAVITY FIELD FROM SATELLITE TECHNIQUES AS PROPOSED TO THE EUROPEAN SPACE AGENCY
C. Reigber *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 221-232 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

N79-21493*# Ohio State Univ., Columbus. Dept. of Geodetic Science.
WORLD GRAVITY STANDARDS
Urho A. Uotila *In its* Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 237-238 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

N79-21494*# Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
THE MEASUREMENT OF SURFACE GRAVITY
J. C. Harrison and L. J. B. LaCoste (LaCoste and Romberg, Inc., Austin Tex.) *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 239-243 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

N79-21495*# Air Force Geophysics Lab., Hanscom AFB, Mass. Terrestrial Sciences Div.
THE AFGL ABSOLUTE GRAVITY PROGRAM
James A. Hammond and Robert L. Iliff *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 245-249 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08N

N79-21496*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
PRESENT STATUS OF MARINE GRAVITY
A. B. Watts *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 251-255 refs (For primary document see N79-21460 12-42)
(Contract N00014-75-C-0210; Grants NSF OCE-77-07941; NSF OCE-77-10647; NSF OCE-77-25993)
Avail: NTIS HC A16/MF A01 CSCL 08N

N79-21497*# Cornell Univ., Ithaca, N. Y. Dept. of Geological Sciences.
GEOID ANOMALIES AND THE NEAR-SURFACE DIPOLE DISTRIBUTION OF MASS
D. L. Turcotte and J. R. Ockendon (Oxford Univ.) *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 257-260 refs (For primary document see N79-21460 12-42)
(Grant NsG-5060)
Avail: NTIS HC A16/MF A01 CSCL 08E

N79-21499*# Ohio State Univ., Columbus. Dept. of Geodetic Science.
COMPARISON OF SURFACE AND SATELLITE GRAVITY DATA
Richard H. Rapp *In its* Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 267-272 refs (For primary document see N79-21460 12-42)
(Grants NGR-36-008-161; NsG-5275)
Avail: NTIS HC A16/MF A01 CSCL 08N

N79-21505*# Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
LINEAR AND NONLINEAR INTERACTIONS BETWEEN THE EARTH TIDE AND A TECTONICALLY STRESSED EARTH
Christopher Beaumont *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 313-318 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08G

N79-21509*# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
OBSERVATION OF THE NEARLY DIURNAL RESONANCE OF THE EARTH USING A LASER STRAINMETER

Judah Levine *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 333-336 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08E

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N79-21715 Michigan Univ., Ann Arbor.
AN ATMOSPHERIC RADIATIVE-CONVECTIVE MODEL WITH INTERACTIVE WATER VAPOR TRANSPORT AND CLOUD DEVELOPMENT Ph.D. Thesis
John Richard Hummel 1978 141 p
Avail: Univ. Microfilms Order No. 7907097

Results are presented from a one dimensional, radiative-convective model that includes interactive water vapor transport and allows internal cloud generation. With the total effective cloud amount fixed, the generated clouds (up to three) are allowed to determine their own heights and thicknesses based on the thermodynamic state of the atmosphere. Latent heat released from cloud formation is returned to the atmosphere.
Dissert. Abstr.

N79-21716# Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
COMPARISON OF TWO TECHNIQUES FOR THE ASSESSMENT OF AREAL RAINFALL AMOUNTS
Gaston Demaree 1978 26 p refs
(Publ-Ser-A-102) Avail: NTIS HC A03/MF A01

The application of linear statistical models to the assessment of areal rainfall amounts are discussed. A technique which takes into account the average annual rainfall surface is considered. The technique was tested, on both a daily and a monthly time basis. Tests were made assuming various densities for the network of precipitation stations in the catchment. From a comparison of the values thus obtained with those arrived at through the classical Tiessen method, both techniques proved equivalent.
Author

N79-21717*# ECON, Inc., Princeton, N. J.
ECONOMIC CONSEQUENCES OF IMPROVED TEMPERATURE FORECASTS: AN EXPERIMENT WITH THE FLORIDA CITRUS GROWERS (AN UPDATE OF CONTROL GROUP RESULTS)
Chris Braen 31 Dec. 1978 270 p refs
(Contract NASw-3047)
(NASA-CR-158468; ECON-78-291-1) Avail: NTIS HC A12/MF A01 CSCL 04B

The economic experiment, the results obtained to date and the work which still remains to be done are summarized. Specifically, the experiment design is described in detail as are the developed data collection methodology and procedures, sampling plan, data reduction techniques, cost and loss models, establishment of frost severity measures, data obtained from citrus growers, National Weather Service and Federal Crop Insurance Corp. Resulting protection costs and crop losses for the control group sample, extrapolation of results of control group to the Florida citrus industry and the method for normalization of these results to a normal or average frost season so that results may be compared with anticipated similar results from test group measurements are discussed.
L.P.

N79-21718# Institut Royal Meteorologique de Belgique, Brussels.
METEOROLOGICAL OBSERVATIONS IN URBAN ENVIRONMENT
A. VanGysegem 1978 19 p refs
(Publ-Ser-B-93) Avail: NTIS HC A02/MF A01

Urban climatology was studied. Some of the problems encountered in the meteorological measurements are: a high degree of turbulence, and the fact that the urban climate is a mixture of different microclimates. The sampling of observational data, the indidence of instrument exposure on the precision of the measurements, and the techniques and methods are discussed.
M.M.M.

N79-21719*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Insitu AIRCRAFT VERIFICATION OF THE QUALITY OF SATELLITE CLOUD WINDS OVER OCEANIC REGIONS
A. F. Hasler and W. C. Skillman Feb. 1979 25 p refs Submitted for publication
(NASA-TM-79718) Avail: NTIS HC A02/MF A01 CSCL 04B

A five year aircraft experiment to verify the quality of satellite cloud winds over oceans using in situ aircraft inertial navigation system wind measurements is presented. The final results show that satellite measured cumulus cloud motions are very good estimators of the cloud base wind for trade wind and subtropical high regions. The average magnitude of the vector differences between the cloud motion and the cloud base wind is given. For cumulus clouds near frontal regions, the cloud motion agreed best with the mean cloud layer wind. For a very limited sample, cirrus cloud motions also most closely followed the mean wind in the cloud layer.
J.M.S.

N79-21720*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE NASA-AMES RESEARCH CENTER STRATOSPHERIC AEROSOL MODEL. 2. SENSITIVITY STUDIES AND COMPARISON WITH OBSERVATORIES
O. B. Toon, R. P. Turco (R and D Associates, Marina del Rey, Calif.), P. Hamill, C. S. Kiang (National Center for Atmospheric Research), and R. C. Whitten Apr. 1979 70 p refs
(NASA-TP-1363; A-7551) Avail: NTIS HC A04/MF A01 CSCL 04A

Sensitivity tests were performed on a one-dimensional, physical-chemical model of the unperturbed stratospheric aerosols, and model calculations were compared with observations. The tests and comparisons suggest that coagulation controls the particle number mixing ratio, although the number of condensation nuclei at the tropopause and the diffusion coefficient at high altitudes are also important. The sulfur gas source strength and the aerosol residence time are much more important than the supply of condensation nuclei in establishing mass and large particle concentrations. The particle size is also controlled mainly by gas supply and residence time. In situ observations of the aerosols and laboratory measurements of aerosols, parameters that can provide further information about the physics and chemistry of the stratosphere and the aerosols found there are provided.
G.Y.

N79-21721*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE NASA-AMES RESEARCH CENTER STRATOSPHERIC AEROSOL MODEL. 1. PHYSICAL PROCESSES AND COMPUTATIONAL ANALOGS
R. P. Turco (R and D Associates, Marina del Rey, Calif.), P. Hamill, O. B. Toon, R. C. Whitten, and C. S. Kiang (National Center for Atmospheric Research) Apr. 1979 100 p refs
(NASA-TP-1362; A-7532) Avail: NTIS HC A05/MF A01 CSCL 04A

A time-dependent one-dimensional model of the stratospheric sulfate aerosol layer is presented. In constructing the model, a wide range of basic physical and chemical processes are incorporated in order to avoid predetermining or biasing the model predictions. The simulation, which extends from the surface to an altitude of 58 km, includes the troposphere as a source of gases and condensation nuclei and as a sink for aerosol droplets. The size distribution of aerosol particles is resolved into 25 categories with particle radii increasing geometrically from 0.01 to 2.56 microns such that particle volume doubles between categories.
Author

N79-21722# Calspan Advanced Technology Center, Buffalo, N. Y.
A PRELIMINARY INVESTIGATION OF THE PRODUCTION OF STABLE FOGS UNDER SUBSATURATED CONDITIONS
E. J. Mack, R. J. Anderson, and J. T. Hanley Oct. 1978 108 p refs
(Contract N00019-78-C-0349)
(AD-A063178; CALSPAN-6287-M-1) Avail: NTIS HC A06/MF A01 CSCL 04/2

Under Contract No. N00019-78-C-0349 from the Naval Air

Systems Command, Calspan Corporation initiated an experimental investigation of the feasibility of producing stable fogs under conditions of subsaturated relative humidity. The objectives of this limited laboratory investigation were: (1) to determine the efficiency of pyrotechnically-generated, hygroscopic aerosols in producing conditions of restricted visibility (at both visible and infrared wavelengths) at relative humidities - 100%; and (2) to assess the utility of evaporation retardants in increasing the persistance (lifetime) of the artificial fogs with lowering relative humidity. In the experiments, measurements of aerosol size spectra (0.01 micron - 10 microns diameters) and optical extinction at both visible and infrared wavelengths were obtained as functions of time and changing relative humidity for a variety of aerosol concentration levels. The Salty Dog aerosol fogs were found to be extremely stable, with visibility improvements of only a factor of 2 occuring when relative humidity was reduced 10%. The evaporation retardant, cetyl alcohol, was found to be ineffective in reducing the visibility improvement factor. GRA

N79-21723# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

STRUCTURAL LOADS ANALYSIS AND SPECIFICATIONS PROJECT: A STOCHASTIC MODEL OF THE WIND ENVIRONMENT Research Report, Jun. 1974 - Aug. 1979

Lars Sentler and C. Allin Cornell Nov. 1978 218 p refs (Grant NSF ENV-73-03345)
(PB-290401/9; MIT-CE-R78-35) Avail: NTIS HC A10/MF A01 CSCL 04B

A way to obtain wind speeds at a site based on the large scale movement of cyclones is presented. Relationships between the pressure field in a cyclone and wind speeds produced in space are used to describe the wind climate at a site. This includes an analytical model of the gradient field of a cyclone, a mathematical relation between the gradient and the corresponding wind speed at gradient height for a point in the gradient field and a relation between the wind speed at gradient height and ground level. A long data base was used to obtain statistics for the main parameters used in the description of the wind climate. Based on this information, wind predictions were made for a number of sites and compared to actual data. Historical information about cyclones has been used as background information in a simulation study for a longer period of time. The result is compared to actual data and extrapolations based on extreme value theory. GRA

N79-21724# National Weather Service, Silver Spring, Md.

COMPUTER WORDED PUBLIC WEATHER FORECASTS

Harry R. Glahn Nov. 1978 31 p refs
(PB-291517/1; NOAA-TM-NWS-TDL-67; NOAA-78120504) Avail: NTIS HC A03/MF A01 CSCL 04B

A computer program is available which produces public weather forecasts in worded form from digital forecasts of weather elements. This program was designed to be implemented concurrently with the AFOS (Automation of Field Operations and Service) system. One version of the program operates on NOAA's large computer system and will send forecasts over the National Distribution Circuit; another version can be run on the local AFOS minicomputers. Input to the program, the options available for use, the decision processes whereby the forecast is constructed, the output of the program, and plans for its use are described. Also, examples are shown of worded forecasts covering a variety of weather situations. GRA

N79-21725# National Oceanic and Atmospheric Administration, Washington, D. C. Federal Coordinator for Meteorological Service and Supporting Research.

NATIONAL WINTER STORMS OPERATIONS PLAN

Richard E. Hallgren Oct. 1978 42 p
(PB-290492/8; FCM-78-3) Avail: NTIS HC A03/MF A01 CSCL 04B

This 10th annual edition of the Plan represents a general update of the previous edition. The most significant changes include revision of reconnaissance tracks on the east coast and addition of reconnaissance tracks and satellite and buoy information over the Gulf of Mexico. The Plan covers that part of the year having a relatively high incidence of winter storms along the east and Gulf coasts (November 1 to April 15). Only those special arrangements between the agencies involved in meeting the objective of furnishing special weather observations for use in warning of severe winter storms along the Gulf and east coasts are listed. GRA

N79-21726# Rochester Univ., N. Y.

BINARY PREDICTION OF WEATHER EVENTS WITH SEVERAL PREDICTORS

K. R. Gabriel and F. C. Pun Sep. 1978 104 p refs
(PB-291629/4; NOAA-78121802) Avail: NTIS HC A06/MF A01 CSCL 04B

Occurrence or non-occurrence of various meteorological events (rainfall, frozen precipitation, etc.) has to be predicted, at various places and in various seasons, from a sizeable number of available predictor variables. Ample historical data are available on each type of binary event, and combining them in a functional form method is sought for analyzing these historical records, selecting the predictors suitable for each type of binary event, and combining them in a functional form which will estimate the probability of occurrence of the event. Prediction equations are required for a large number of locations, seasons and meteorological events, hence the method must be automated and can allow much interactive analysis. GRA

N79-21727# Georgia Marine Science Center, Savannah.

OCEANOGRAPHIC AND METEOROLOGICAL DATA 15 km OFF THE COAST OF GEORGIA. DATA REPORT NUMBER 1

J. O. Blanton (Skidaway Inst. of Oceanography), L. L. Bailey (Skidaway Inst. of Oceanography), D. W. Hayes (Savannah River Lab., Aiken, S. C.), and A. S. Dicks (Savannah River Lab., Aiken, S. C.) Oct. 1978 56 p
(Contracts EY-77-S-09-1025; AT(07-2)-1; Grant NOAA-04-7-158-44126)
(PB-291863/9; TR-78-6; NOAA-78121503) Avail: NTIS HC A04/MF A01 CSCL 08J

Weekly plots of hourly data, including wind, barometric pressure, currents, air and ocean temperature are presented for the period February 1977 - May 1977 for nearshore areas off Georgia and South Carolina. GRA

N79-21728# National Weather Service, Kansas City, Mo. National Severe Storms Forecast Center.

A SUBJECTIVE ASSESSMENT OF MODEL INITIAL CONDITIONS USING SATELLITE IMAGERY

John E. Hales, Jr. Nov. 1978 25 p refs
(PB-291593/2; NOAA-TM-NWS-NSSFC-2; NOAA-78121404) Avail: NTIS HC A02/MF A01 CSCL 04B

Numerical models accuracy is limited by initialization. The forecaster has available high quality satellite pictures which enable him to qualitatively evaluate circulation systems. Satellite imagery is used frequently to recognize regions where there is an initialization problem. When such an area is identified, the numerical forecast can be substantially improved upon. A detailed analysis of the development of the damaging storm that struck Southern California on February 10, 1978 is presented. This storm created serious initialization problems. Satellite imagery is used to improve on the computer models' initial analysis in several cases. GRA

N79-21729# Research Inst. of National Defence, Stockholm (Sweden).

CHARACTERISTICS OF TURBULENCE IN THE ATMOSPHERIC BOUNDARY LAYER

Sture Wickers 1978 19 p refs
(PB-291544/5; FOA-B-30025-E3; ISBN-91-7056-051-X) Avail: NTIS HC A02/MF A01 CSCL 04B

Turbulence was measured with three-axis sonic anemometers. The results which are presented are from three test periods on different sites. In all cases the sensors were mounted on masts six meters above ground. Data were sampled with ten values per second during 15-50 minutes, and were recorded on magnetic tape. During the third test period the data were also partly treated on-line in a minicomputer. Evaluation and analysis of the data were in all cases done on an IBM 360 computer. Characteristics of turbulence in space and time are evaluated. A result of particular interest is that there is evidence that wind fluctuations sometimes do not follow a normal distribution, but rather vary with time as a square wave shifting sign at random.

In an appendix the covariance and spectrum of a stationary Markov process with two states and constant transition intensities are derived. GRA

N79-21730# National Oceanic and Atmospheric Administration, Princeton, N. J. Geophysical Fluid Dynamics Lab.
ACTIVITIES, FY78, PLANS, FY79
30 Sep. 1978 133 p refs
(PB-290743/4; NOAA-78121502) Avail: NTIS HC A07/MF A01 CSCL 04B

The report describes activities for FY 78 and plans for FY 79 of the FY 79 of the Geophysical Fluid Dynamics Laboratory. The major research categories are: Climate dynamics; Middle atmosphere dynamics and chemistry; Experimental prediction; Oceanic circulation; Planetary circulations; Observational studies; Hurricane dynamics; Mesoscale dynamics; and, Convection and turbulence. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N79-21731 California Univ., San Diego.
STUDIES OF MARINE HYDROTHERMAL ACTIVITY IN A COASTAL ENVIRONMENT, PUNTA BANDA, BAJA CALIFORNIA NORTE, MEXICO, AND ITS GEOCHEMICAL IMPLICATIONS FOR MODELLING MARINE HYDROTHERMAL PROCESSES IN THE OCEAN Ph.D. Thesis
Victor Manuel VicenteVidalLorandi 1978 246 p
Avail: Univ. Microfilms Order No. 7904146

The hydrothermal activity occurs within the Agua Blanca Fault, a major transverse structure of Northern Baja California. Hot springwater samples were collected and analyzed. Marked differences exist between the submarine hot springwaters, groundwater, and local seawater. SiO2, HCO3(-), Ca, K, Li, B, Ba, Rb, Fe, Mn, As and Zn are enriched in the submarine hot springwater, while Cl, Na, SO4(2-), Mg, Cu, Ni and Cd are depleted in relation to average and local seawater values. Very high temperatures, at the hydrothermal vents, were recorded. Visible gaseous emanations rich in CH4 and N2 exist with the hydrothermal solutions. Metalliferous deposits, pyrite, were encountered. The evolutionary history and geothermal characteristics of the Ensenada-Punta Banda hydrothermal systems is also presented. Field measurements of the land hot springs of the locality as well as the intertidal and marine occurrences display a high temperature, moderate salinity and high silica zonation within the Punta Banda sector of the Agua Blanca Fault.
Dissert. Abstr.

N79-21732 Columbia Univ. Teachers Coll., New York.
THE EFFECTS OF LONG WAVELENGTH AND SHORT WAVELENGTH ULTRAVIOLET IRRADIATION ON SOME MARINE ALGAE Ph.D. Thesis
Allen Gary Rauch 1978 190 p
Avail: Univ. Microfilms Order No. 7909015

Axenic cultures of Dunaliella tertiolecta, Isochrysis galbana and Amphora coffeaeformis, grown in Guillard's F/8 medium, were assayed to determine the morphological and physiological effects of long wavelength (366 nm) ultraviolet irradiation at intensities of 60 microwatts/sq cm, 120 microwatts/sq cm and 180 microwatts/sq cm. Short wavelength studies (254 nm) at intensities of 80 microwatts/sq cm, 120 microwatts/sq cm and 20 microwatts/sq cm were done with only Dunaliella and Isochrysis. It was concluded that while long wavelength ultraviolet irradiation might have little, if any, effect on marine algae, short wavelength exposures could cause significant damage.
Dissert. Abstr.

N79-21733 Wisconsin Univ. - Madison.
TECHNOLOGICAL AND ENVIRONMENTAL CONSIDERATIONS IN THE EXPLORATION AND EXPLOITATION OF MARINE MINERALS Ph.D. Thesis
Michael James Cruickshank 1978 256 p
Avail: Univ. Microfilms Order No. 7823726

It is demonstrated that potential scarcities by the Year 2000 are indicated for 31 mineral commodities in the United States, including uranium, chromium, cobalt, columbium, nickel, tantalum, tungsten, aluminum, antimony, bismuth, cadmium, cesium, copper, germanium, gold, indium, lead, magnesium, mercury, platinum, silver, tin, zinc, asbestos, barium, diamond, fluorine, graphite, mica, quartz crystal, and sand and gravel. Similarly on a world basis, potential scarcities are indicated for 19 commodities, including uranium, tungsten, aluminum, bismuth, cadmium, copper, germanium, gold, indium, lead, mercury, silver, tin, zinc, asbestos, barium, diamond, fluorine, and sand gravel. Dissert. Abstr.

N79-21734# Georgia Marine Science Center, Savannah.
A CTD SYSTEM: DESCRIPTION, OPERATION, DATA ACQUISITION AND PROCESSING
W. S. Chandler, L. P. Atkinson, J. J. Singer, P. G. OMalley, and C. V. Baker Oct. 1978 92 p refs
(Contract EY-76-S-09-0883)
(PB-291865/4; TR-78-7; NOAA-78121504) Avail: NTIS HC A05/MF A01 CSCL 08J

The conductivity/temperature/depth (CTD) system has four major components: (1) the underwater unit, consisting of the depth, conductivity, and temperature sensors, and a mixer that powers the sensors and multiplexes the signals; (2) the winch, conductor wire, and Rosette Multi-Bottle Array fitted with a variety of Niskin sampling bottles; (3) the deck unit that powers the rosette and the CTD sensors and filters and digitizes the multiplexed CTD signal; and (4) the data processing system. All components of the CTD system are listed. The hardware components, the shipboard operating procedure, and the software of the system are described. Trouble-shooting problems, causes, and repairs for those problems are reported. GRA

N79-21735# South Carolina Univ., Columbia. Int. for Marine Biology and Coastal Research.
THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM, 2 Final Report, 1 Mar. 1976 - 28 Feb. 1978
F. J. Vernberg, W. Kitchen, H. McKellar, K. Summers, and R. Bonnell Oct. 1978 88 p refs
(Grant EPA-R-804407-01)
(PB-289963/1; EPA-600/3-78-092) Avail: NTIS HC A05/MF A01 CSCL 08A

An update of the macroecosystem model of the North Inlet Estuary near Georgetown, SC and a continuing study of experimental saltmarsh microecosystems are described. Replicate experimental salt-marsh units at the microecoysystem level as diagnostic tools for assessing long-and short-term pollution effects on the Spartina alterniflora salt-marsh community were developed. GRA

N79-21736# Woods Hole Oceanographic Institution, Mass. POLYMODE XBT Group.
POLYMODE XBT SURVEYS BY THE SOVIET RESEARCH VESSELS MIKHAIL LOMONOSOV, VITYAZ AND AKADEMIK VERNADSKY, AND THE AMERICAN RESEARCH VESSEL ENDEAVOR, 3-24 DECEMBER 1977
William G. Metcalf Oct. 1978 23 p refs
(Grant NSF OCE-77-01026)
(PB-291293/9; XBT/TR-78/10; NSF/IDOE-78-140) Avail: NTIS HC A02/MF A01 CSCL 08J

This is the most complex POLYMODE XBT survey to date, and the largest in terms of area covered. Three Soviet Research Ships, Mikhail Lomonosov, Vityaz, and Akademik Vernadsky surveyed the usual POLYMODE Area between 26 and 20 degrees N, 67 and 73 degrees W. The American Research Vessel, Endeavor, surveyed an adjoining area to the north with about a 160 km overlap with the Soviet observations. Endeavor's area of operation was between 30 and 34 degrees N, 67 deg 30 min and 72 deg 30 min W. The track charts of the 4 ships are shown along with the XBT observation points. Vertical temperature cross-sections were drawn up for all the major survey lines. GRA

N79-21737# Woods Hole Oceanographic Institution, Mass. POLYMODE XBT Group.
POLYMODE XBT SURVEYS BY THE SOVIET RESEARCH VESSELS VITYAZ AND MIKHAIL LOMONOSOV, 25 DECEMBER 1977 - 7 JANUARY 1978
William G. Metcalf Oct. 1978 16 p refs

(Grant NSF OCE-77-01026)
(PB-291294; XBT/TR-78/11; NSF/IDOE-78-141) Avail: NTIS HC A02/MF A01 CSCL 08J

Between the latter part of December 1977 and mid-January 1978 three Soviet Union oceanographic ships were engaged in overlapping POLYMODE XBT surveys. The R/V Vityaz made a grid of 52 XBT observations between 25 December 1977 and 4 January 1978. The R/v Mikhail Lomonosov, on Cruise 33-3 between 25 December 1977 and 7 January 1978, made 56 XBT observations. Profiles of the temperature structure in the upper 800 m of the water column in the track charts are presented. The surface temperature field as plotted from these two research vessels is presented. Overlapping with these observations both in time and in area, the R/V Akademik Vernadsky made 128 XBT observations between 2 and 15 January 1978. In the main POLYMODE Area only a few observations show temperatures above 25C, whereas in the 3.24 December survey, a broad band of water warmer than 25.5C was found. GRA

N79-21738# National Oceanic and Atmospheric Administration, Washington, D. C.
US OCEAN POLICY IN THE 1970S: STATUS AND ISSUES
Oct. 1978 336 p refs
(PB-292155/9; NOAA-79012402) Avail: NTIS HC A15/MF A01 CSCL 05B

Current ocean policies in each major area of civilian ocean and coastal affairs are discussed including background information on the evolution of policies, and the status of Federal ocean programs. Some of the principal issues discussed are: fisheries, coastal resources, wetlands, siting electric power plants, recreation, hazards, mining, marine transportation, education, and marine science and technology. GRA

N79-21739# National Oceanic and Atmospheric Administration, Washington, D. C.
US OCEAN POLICY IN THE 1970S: STATUS AND ISSUES: POLICY OVERVIEW
Oct. 1978 58 p
(PB-292291/2; NOAA-79012403) Avail: NTIS HC A04/MF A01 CSCL 05B

The Nation's overall stake in its ocean and coastal resources and the status of the six major elements of U. S. ocean policy is reviewed. Marine fisheries, coastal resources, the marine environment, marine science and technology, marine transportation, and marine employment, education, and training are the factors considered. The organizational structure that is employed by the Federal Government in carrying out the national ocean effort is included. GRA

N79-21478*# Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
GEODETIC MEASUREMENTS AT SEA FLOOR SPREADING CENTERS
F. N. Spiess *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 131-136 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08C

N79-21492*# Woods Hole Oceanographic Institution, Mass.
PROBLEMS IN DETERMINING SEA SURFACE TOPOGRAPHY
John A. Whitehead, Jr. *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 233-236 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08C

N79-21501*# Colorado Univ., Boulder. Dept. of Geological Sciences.
IMPLICATIONS OF CAVITY, TOPOGRAPHIC AND GEOLOGIC INFLUENCES ON TILT AND STRAIN OBSERVATIONS
J. C. Harrison *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 283-287 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08C

N79-21502*# National Oceanic and Atmospheric Administration, Seattle, Wash. National Marine Environmental Lab.
OPEN OCEAN TIDE MODELLING
Michael E. Parke *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 289-297 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08C

N79-21503*# Institute of Oceanographic Sciences, Birkenhead (England).
WHAT CAN EARTH TIDE MEASUREMENTS TELL US ABOUT OCEAN TIDES OR EARTH STRUCTURE?
T. F. Baker *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 299-307 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08C

N79-21504*# California Univ., San Diego. Dept. of Physics.
HIGH PRECISION TIDE SPECTROSCOPY
John M. Goodkind *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 309-311 refs (For primary document see N79-21460 12-42)
(Grants NGR-05-009-246; NSF EAR-75-21621; NBS-5-9013; Contracts DI-14-08-0001-G-297; DI-14-08-0001-G-374)
Avail: NTIS HC A16/MF A01 CSCL 08C

N79-21506*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
THE INVERSE PROBLEM: OCEAN TIDES DERIVED FROM EARTH TIDE OBSERVATIONS
John T. Kuo *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 319-326 refs (For primary document see N79-21460 12-42)
(Contract ONR-TO-0605; Grant NSF EAR-76-24383)
Avail: NTIS HC A16/MF A01 CSCL 08C

N79-21507*# Kiel Univ. (West Germany). Inst. of Geophysics.
TIDAL FRICTION IN THE SOLID EARTH
Jochen Zschau *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern Symp. 1978 p 327-330 refs (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 08C

N79-21508*# Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
BODY TIDES ON AN ELLIPTICAL ROTATING EARTH
John M. Wahr *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 331-336 refs (For primary document see N79-21460 12-42)
(Grant NsG-7319)
Avail: NTIS HC A16/MF A01 CSCL 08C

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N79-21740 Missouri Univ. - Columbia.
THE GROWTH KINETICS OF FRESHWATER ALGAE Ph.D. Thesis
David Edward Brune 1978 154 p
Avail: Univ. Microfilms Order No. 7906850

The batch and chemostat methods were compared as the means of quantifying the carbon limited growth response of Scenedesmus quadricauda and Anabaena flos aquae. It was found that the batch method was the more practical means of obtaining such data. This method was used to obtain the carbon limited growth response of Scenedesmus quadricauda, Chorella sp., Anabaena flos aquae, Selenastrum capricoriutum, Microcoelus vaginatus and Oscillatoria sp. at five different temperatures and four different light levels. It was found that the growth response of these algae could be described reasonably well as a Monod fit of the specific growth rate vs. the carbon dioxide concentration. These data were used to demonstrate the importance of temperature, light and carbon dioxide concentration in affecting algal species competition. Mixed cultures of Anabaena flos aquae, Chlorella sp. and Scenedesmus quadricauda were grown and it

was observed that interaction in mixed culture may, in some cases, modify the growth response of these algae.Dissert. Abstr.

N79-21741*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

COMPUTER PROGRAM FOR CALCULATION OF OXYGEN UPTAKE

B. L. Castle, G. Castle, and J. E. Greenleaf Apr. 1979 13 p refs

(NASA-TM-78585; A-7890) Avail: NTIS HC A02/MF A01 CSCL 06P

A description and operational precedures are presented for a computer program, written in Super Basic, that calculates oxygen uptake, carbon dioxide production, and related ventilation parameters. Program features include: (1) the option of entering slope and intercept values of calibration curves for the O2 and CO2 and analyzers; (2) calculation of expired water vapor pressure; and (3) the option of entering inspured O2 and CO2 concentrations. The program is easily adaptable for programmable laboratory calculators. Author

N79-21742*# Florida Inst. of Tech., Melbourne. School of Science and Engineering.

PHOTOSYNTHETHIC CARBON REDUCTION BY SEAGRASSES EXPOSED TO ULTRAVIOLET B RADIATION Final Technical Report

15 Mar. 1979 45 p refs

(Contract NAS9-15516)

(NASA-CR-160144) Avail: NTIS HC A03/MF A01 CSCL 06C

The species of seagrasses were selected on the basis of their dominance in the marine system, contribution to total productivity, and importance to the life histories of organisms in the Indian River lagoon system along the central Florida east coast. The three seagrasses were Halophilia engelmannii, Halodule wrightii, and Syringodium filiforme. These seagrasses form an excellent experimental system as their areas of dominance fall more or less along a natural gradient of UV-B and photosynthetically active radiation (PAR) penetration. The sensitivity of photosynthesis in the seagrasses was determined and their photosynthetic response to levels of UV-B simulating atmospheric ozone depletion was monitored. Further experiments explore the possible attenuation or repair of UV-B induced photosynthetic inhibition by PAR, the role of epiphytic growth upon seagrasses as a protective UV-B shield, and the inhibition of photosynthesis in response to UV-A is studied. G.Y.

N79-21743*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A METHOD FOR SEPARATING BIOLOGICAL CELLS Patent Application

D. E. Brooks, inventor (to NASA) 6 Mar. 1979 11 p

(NASA-Case-MFS-23883-1; US-Patent-Appl-SN-017888) Avail: NTIS HC A02/MF A01 CSCL 06C

A method for separating biological cells by suspending a mixed cell population in a body of aqueous polymer is described. The system consists of phases for which these cells exhibit an affinity including at least one droplet phase with a surface potential and one droplet phase characterized by another surface potential. The system is subjected to an electrostatic field established between a pair of electrodes with the field being of sufficient intensity for causing some of the droplets to migrate toward one of the electrodes with an attendant separation of the cells. NASA

N79-21744*# National Aeronautics and Space Administration, Washington, D. C.

MICROANALYTICAL IDENTIFICATION OF BARIUM SULPHATE CRYSTALS IN STATOLITHS OF CHARA RHIZOIDS

Klaus Schroeter, Andre Lauchli, and Andreas Sievers Apr. 1979 19 p refs Transl. into ENGLISH from Planta (Berlin), Vol. 122, 1975 p 213-225 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by the Botanical Inst. of the Bonn Univ., West Germany

(Contract NASw-3199)

(NASA-TM-75611) Avail: NTIS HC A02/MF A01 CSCL 06C

In contrast to higher plants, Chara rhizoids contain statolith vacuoles filled with biocrystallites of BaSO4 in the form of rods composed of globular subunits ca. 7 nm in diameter. The revelation of the crystallites under electron microscopy is dependent on the fixative; best structural preservation was observed after fixation in a buffered glutaraldehyde + acrolein solution; OsO4 and KMnO4 partially dissolved both the biocrystallites and synthetic BaSO4. Author

N79-21745# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 60

2 Apr. 1979 60 p refs Transl. into ENGLISH from various Russian journals

(JPRS-73135) Copyright. Avail: NTIS HC A04/MF A01

Research is reported on liquid crystal development for medicine; the training effect of recognition of different alphabets of visual stimuli; strontium-90 as a factor in environmental pollution. The proceedings of the Orenbury symposium on mycotoxins are reviewed. For individual titles, see N79-21746 through N79-21749.

N79-21746# Joint Publications Research Service, Arlington, Va.

LIQUID CRYSTAL DEVELOPMENTS FOR MEDICINE c52

A. Savvov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 60 (JPRS-73135) 2 Apr. 1979 p 1-2 Transl. into ENGLISH from Sots. Industr. (Moscow), no. 38, 14 Feb. 1979 p 6 (For primary document see N79-21745 12-51)

Avail: NTIS HC A04/MF A01

The use of polyethylene discs coated with liquid crystals of cholesterol esters to determine temperature changes of the skin is discussed. F.O.S.

N79-21747# Joint Publications Research Service, Arlington, Va.

TRAINING EFFECT OF RECOGNITION OF DIFFERENT ALPHABETS OF VISUAL STIMULI c53

N. V. Turkina *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 60 (JPRS-73135) 2 Apr. 1979 p 3-12 refs Transl. into ENGLISH from Tekhn. Estet ika (Moscow), no. 1, 1979 p 12-15 (For primary document see N79-21745 12-51)

Copyright. Avail: NTIS HC A04/MF A01

The influence of training on the temporal characteristics of identification of stimuli was studied by determining the time necessary for visual identification and the latent periods for oral responses. Symbols, letters, and positioning were used. F.O.S.

N79-21748# Joint Publications Research Service, Arlington, Va.

STRONTIUM-90 AS A FACTOR IN ENVIRONMENTAL POLLUTION c45

V. I. Ternov, M. A. Vinogradov, N. V. Gurskaya, and N. A. Fedoseyeva *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 60 (JPRS-73135) 2 Apr. 1979 p 33-37 refs Transl. into ENGLISH from Zdravookhr. Beloruss. (Minsk, USSR), no. 1, 1979 p 33-35 (For primary document see N79-21745 12-51)

Copyright. Avail: NTIS HC A04/MF A01

Results of the systematic observations of the contamination of basic foods by strontium-90 from 1963 to 1975 are summarized along with the levels of strontium-90 accumulation in bone tissue for adults in Belorussia. Radiochemical methods were used to separate strontium-90 from foods. The levels of accumulation in bone tissue were computed on factual data on the nuclide content of extracted teeth from the general population. It was found (1) that there was a steady drop of the intake, (2) the mean daily intake dropped from 87.1 to 18 picacurries during this period, and (3) 91% of the strontium enters the body from bread. F.O.S.

N79-21749# Joint Publications Research Service, Arlington, Va.

ORENBURG SYMPOSIUM ON MYCOTOXINS c52

V. I. Bilay and L. Ye. Olifson *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 60 (JPRS-73135) 2 Apr. 1979 p 43-52 Transl. into ENGLISH from Izv. Akad.

Nauk SSSR: Ser. Biol. (Moscow), no. 1, 1979 p 150-155 Symp. held in Orenburg, USSR, 28-30 Sep. 1977 (For primary document see N79-21745 12-51)
Avail: NTIS HC A04/MF A01

Research papers presented at the conference on problems of mycotoxicology are reviewed. Topics discussed include: present state of the growth of toxic forming fungi, aspects of the mechanisms of effects of several mycotoxins, epidemiology and pathogenesis of mycotoxins, characterization of the pathogenesis of animal mycotoxins, and toxins and their effects produced by specific fungi. F.O.S.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N79-21750* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METABOLIC RATE METER AND METHOD Patent
Thomas Ivan Taylor (Isomet Corp., Palisades Park, N.J.) and Irving Warren Ruderman, inventors (to NASA) Issued 13 Aug. 1968 3 p Filed 2 Jul. 1963 Sponsored by NASA
(NASA-Case-MSC-12239-1; US-Patent-3,396,719; US-Patent-Appl-SN-292340; US-Patent-Class-128.2.07) Avail: US Patent and Trademark Office CSCL 06B

A method is described for measuring the dynamic metabolic rate of a human or animal. The ratio of the exhaled carbon dioxide to a known amount of C(13)02 introduced into the exhalation is determined by mass spectrometry. This provides an instantaneous measurement of the carbon dioxide generated. F.O.S.

N79-21751* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY, SUPPLEMENT 191
Mar. 1979 63 p
(NASA-SP-7011(191)) Avail: NTIS HC E03 CSCL 06E

A bibliographical list of 182 reports, articles, and other documents introduced into the NASA scientific and technical information system in February 1979 is presented. G.Y.

N79-21752 Pennsylvania State Univ., University Park.
A COMPARISON OF SWEATING RESPONSES IN MEN AND WOMEN BEFORE AND AFTER ACCLIMATION TO HUMID HEAT Ph.D. Thesis
Barbara Ann Avellini 1978 140 p
Avail: Univ. Microfilms Order No. 7909039

Four men and four women with comparable maximal aerobic capacities and equal surface areas and surface area to mass ratios underwent a three-hour stress test before and after a ten-day acclimation to humid heat. Women were tested in both the pre- and post-ovulatory phases of the menstrual cycle (pre-OV, post-OV). Prior to acclimation, the pre-OV women exhibited the longest tolerance times and lowest rectal temperatures and heart rates (HR) over the duration of the test. Men secreted considerably more sweat per unit area than did the women in either phase of the cycle, yet they demonstrated shorter tolerance times and higher body temperatures and HR. During post-OV, women reacted similarly to the men, although their sweat rates were significantly less. Following acclimation, the rectal temperature and HR of the three groups were similar while the discrepancy between the sweat rates of the men and women was magnified. Dissert. Abstr.

N79-21753 Duke Univ., Durham, N. C.
MULTI-CHANNEL STIMULATION OF PERIPHERAL NERVE TRUNKS Ph.D. Thesis
Cedric Frank Walker 1978 246 p
Avail: Univ. Microfilms Order No. 7906996

First, using experimental animals, an investigation of the extracellular potentials and muscular activities elicited by constant current stimulation applied to multiple points on a peripheral nerve trunk (the sciatic) was undertaken. Second, an investigation of the limitations of single channel stimulation was made using a human volunteer who had an implanted median nerve stimulator for sensory feedback purposes. A full battery of psychophysical evaluations of perceived sensations was performed. The third and final portion of this study involved the mapping of human peripheral nerves during surgical procedures. Stimulation was applied radially to 12 points around the median or sciatic nerve, and the loci of the derived perceptions or motor responses were plotted as a function of the radial location of the applied stimulus to the nerve. Dissert. Abstr.

N79-21754 Pennsylvania State Univ., University Park.
X-RAY BACKSCATTER IMAGING Ph.D. Thesis
Bruce C. Towe 1978 120 p
Avail: Univ. Microfilms Order No. 7909141

A three-dimensional X-ray imaging technique is proposed. Radiographs are produced by using the X-ray flux backscattered by an object under inspection. Tomographic slices of the object can be produced in image planes perpendicular to the beam incidence. The imaging technique produces radiographic backprojections of the internal features of an object from a frontal perspective. Practical penetration depths of up to 5cm of tissue equivalent materials, and 1/2 inch aluminum, at 1mm resolution are demonstrated with 100 KVP X-ray energies. Dissert. Abstr.

N79-21755 Pennsylvania Univ., Philadelphia.
METAL BIOELECTRODE POLARIZATION: A FREQUENCY AND TIME DOMAIN ANALYSIS Ph.D. Thesis
Banu Onaral 1978 334 p
Avail: Univ. Microfilms Order No. 7908777

Time and frequency dependent properties of bioelectrodes (Platinum and Elgiloy) are studied in the linear and nonlinear range with the ultimate aim of developing operational rules for the design and evaluation of stimulation electrodes. The work described includes: (1) phenomenological analysis of the electrode-electrolyte interface with emphasis on the limits of linear behavior using small-signal techniques in frequency and time domains; (2) electrode polarization impedance measurements covering seven decades of frequency starting at 1 mHz, (3) electrode overpotential measurements evoked by current and voltage steps over six decades of time duration; (4) development of rules which define the onset of nonlinearity in both frequency and time domains; and (5) discussion of the implications of metal electrode polarization research on biomedical (mainly stimulation) applications. Dissert. Abstr.

N79-21756 Missouri Univ. - Columbia.
A SYSTEMATIC APPROACH TO COMPUTER ANALYSIS OF PULMONARY VASCULAR PATTERNS Ph.D. Thesis
George Edward Moore 1978 273 p
Avail: Univ. Microfilms Order No. 7906948

The qualitative/quantitative information which can be used in a computer analysis of pulmonary vascular patterns is described. A method of assessing the quantity of blood flowing in the pulmonary circulatory system from the radiographic image is studied. Areas investigated to determine the use of computer analysis of pulmonary vascular patterns include: (1) radiographic image segments, particularly of the lung to determine if there exists a region of maximum information; (2) radiological findings in diagnosis of pulmonary vasculature; (3) the correlation between cardiac catheterization data and radiological findings in diagnosis of pulmonary vasculature; and (4) integration of the computer into the analysis of textural patterns on a statistical level. M.M.M.

N79-21757 Florida Univ., Gainesville.
THE DESIGN AND CONSTRUCTION OF A MINIATURE DOSIMETER FOR THE STUDY OF THE EFFECTS OF AIR CAVITIES IN RADIATION THERAPY Ph.D. Thesis
Marlene Hope Patricia McKetty 1978 140 p
Avail: Univ. Microfilms Order No. 7907774

A miniature dosimeter utilizing silicon p-i-n chips was designed for performing in vivo measurements in radiation therapy. The dosimeter, which is less than 2 mm in diameter, can be inserted into patients and phantoms for rapid measurements. An important advantage of this type of dosimeter over thermoluminescent dosimeters and miniature ionization chambers is the instant readout and the elimination of a waiting period between measurements. Dissert. Abstr.

N79-21758 Bowling Green State Univ., Ohio.
EFFECTS OF FILTERING ELECTROENCEPHALIC SIGNALS ON AUDITORY EVOKED BRAIN STEM RESPONSES Ph.D. Thesis
Dianne Jorgi Mecklenburg 1978 91 p
Avail: Univ. Microfilms Order No. 7907989

The effects of filtering on the brain stem auditory evoked response were investigated. Five filtering conditions in which the low-frequency cutoff was held constant and five conditions in which the high-frequency cutoff was held constant were used. Fourteen subjects were tested using click stimuli. Thirteen peak points including both positive and negative peaks were measured for amplitude and latency. Analyses of variance were computed for the measurements of latency and amplitude and revealed that significant differences existed among the filtering conditions. The specific findings are given. Dissert. Abstr.

N79-21759# Office of Radiation Programs, Washington, D. C.
RADIATION PROTECTION ACTIVITIES, 1977 Annual Report
Aug. 1978 142 p refs
(PB-290215/3; EPA-520/4-78-003) Avail: NTIS HC A07/MF A01 CSCL 06R

The activities of several Federal agencies involved in controlling medical X-ray exposures, managing nuclear power plant effluents, protecting workers exposed to radiation, and monitoring fallout are surveyed as well as some of the less obvious activities. The division of responsibilities within the Federal government is defined, and some relevant congressional and judicial actions are summarized. A list of pertinent 1977 Federal publications is provided. GRA

N79-21760# National Technical Information Service, Springfield, Va.
BIOLOGICAL EFFECTS OF LASER RADIATION, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report
Pernell W. Crockett Feb. 1979 247 p
(NTIS/PS-79/0019/4) Avail: NTIS HC $28.00/MF $28.00 CSCL 06R

The bibliography cites reports on radiation injuries, permissible dosage, protective devices, and safety measures. Included are references on the pathology of eye lesions caused by lasers. This updated bibliography contains 242 abstracts, none of which are new entries to the previous edition. GRA

N79-21761# National Technical Information Service, Springfield, Va.
BIOLOGICAL EFFECTS OF LASER RADIATION, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jan. 1978
Elizabeth A. Harrison Feb. 1979 28 p Supersedes NTIS/PS-78/0036; NTIS/PS-77/0028; NTIS/PS-75/893; NTIS/PS-75/011 (NTIS/PS-79/0020/2; NTIS/PS-78/0036; NTIS/PS-77/0028; NTIS/PS-75/893; NTIS/PS-75/011) Avail: NTIS HC $28.00/MF $28.00 CSCL 06R

The bibliography cites reports on radiation injuries, permissible dosage, protective devices, and safety measures. Included are references on the pathology of eye lesions caused by lasers. GRA

N79-21762# National Technical Information Service, Springfield, Va.
EFFECTS OF FATIGUE ON HUMAN BEHAVIOR AND PERFORMANCE. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Feb. 1979
Mary E. Young Mar. 1979 194 p Supersedes NTIS/PS-77/0064; NTIS/PS-76/0095; NTIS/PS-75/161 (NTIS/PS-79/0071/5; NTIS/PS-78/0126; NTIS/PS-77/0064; NTIS/PS-76/0095; NTIS/PS-75/161) Avail: NTIS HC $28.00/MF $28.00 CSCL 06S

References on the psychological and physiological effects of mental and physical fatigue are cited. Reports on circadian rhythm, work - rest schedules, sleep deprivation, and physical endurance are included. GRA

N79-21763# Professional Staff Association of the Rancho Los Amigos Hospital, Inc., Downey, Calif.
EFFECTS OF OXIDES ON NITROGEN, CARBON MONOXIDE AND PHOTOCHEMICAL OXIDANTS ON THE ECG DURING EXERCISE AND ON CARDIOPULMONARY FUNCTION Final Report
William S. Linn and Jack D. Hackney 31 May 1978 50 p refs Sponsored by Coordinating Res. Council, Inc.
(PB-291595/7; CRC-APRAC-CAPM-21-74-2) Avail: NTIS HC A03/MF A01 CSCL 06T

The effect on arterial blood oxygenation of exposure to 0.2 ppm ozone in purified air for two hours, with intermittent light exercise and heat stress was assessed. Twelve healthy, volunteer subjects had blood gases measured before and during exposure through the use of an in-dwelling cannula in the brachial artery. Six of these and six others underwent separate studies in which blood-gas measurements were made on arterialized blood collected from the earlobe after application of a vasodilating agent. No evidence for an adverse effect of ozone on arterial oxygenation was found. These results fail to confirm a previous report that exposure to 0.1 ppm ozone significantly disturbed arterial oxygenation. GRA

N79-21746# Joint Publications Research Service, Arlington, Va.
LIQUID CRYSTAL DEVELOPMENTS FOR MEDICINE
A. Savvov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 60 (JPRS-73135) 2 Apr. 1979 p 1-2 Transl. into ENGLISH from Sots. Industr. (Moscow), no. 38, 14 Feb. 1979 p 6 (For primary document see N79-21745 12-51)
Avail: NTIS HC A04/MF A01

N79-21749# Joint Publications Research Service, Arlington, Va.
ORENBURG SYMPOSIUM ON MYCOTOXINS
V. I. Bilay and L. Ye. Olifson *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 60 (JPRS-73135) 2 Apr. 1979 p 43-52 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Biol. (Moscow), no. 1, 1979 p 150-155 Symp. held in Orenburg, USSR, 28-30 Sep. 1977 (For primary document see N79-21745 12-51)
Avail: NTIS HC A04/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N79-21764 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ESTIMATION OF AIRCRAFT TARGET MOTION USING PATTERN RECOGNITION ORIENTATION MEASUREMENTS Ph.D. Thesis
Jerry Donald Kendrick 1978 205 p
Avail: Univ. Microfilms Order No. 7908881

A new approach to estimating motion of a highly maneuvering aircraft target in an air-to-air tracking scenario is presented. An interactive filter system is developed which provides an improved estimate of target motion states by conditioning kinematic filter estimates upon target aspect angle data. Pattern recognition techniques used with an electro-optical tracker are presumed to provide this target aspect information. A target orientation filter processes the aspect angle measurements by statistically weighting measured aspect angles with the current best estimate of target kinematics. The aerodynamic lift equation is used to relate approximate angle of attack to target velocity and acceleration. A novel statistical model for aircraft target normal acceleration is also developed to better represent unknown target accelerations. Simulation results of realistic three-dimensional scenarios are presented to evaluate the performance of the interactive filter system. Dissert. Abstr.

N79-21747# Joint Publications Research Service, Arlington, Va.
TRAINING EFFECT OF RECOGNITION OF DIFFERENT ALPHABETS OF VISUAL STIMULI
N. V. Turkina *In its* Transl. on USSR Sci. and Technol.: Biomed.

and Behavioral Sci., No. 60 (JPRS-73135) 2 Apr. 1979 p 3-12 refs Transl. into ENGLISH from Tekhn. Estet ika (Moscow), no. 1, 1979 p 12-15 (For primary document see N79-21745 12-51)
Copyright. Avail: NTIS HC A04/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N79-21765* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROTECTIVE GARMENT VENTILATION SYSTEM Patent
Ronald Lang, inventor (to NASA) (United Aircraft Corp., E. Hartford, Conn.) Issued 6 Jan. 1970 8 p Filed 6 Oct. 1966 Sponsored by NASA
(NASA-Case-XMS-04928-1; US-Patent-3,487,765; US-Patent-Appl-SN-584914; US-Patent-Class-98-1) Avail: US Patent and Trademark Office CSCL 06B

A method of and apparatus for ventilating a protective garment wherein the direction of flow of a ventilating and purging gas within portions of the garment may be reversed in order to compensate for changes in environment and activity of the wearer, is presented. The method and apparatus also contemplates the establishment of a condition wherein the entire flow of ventilating gas is first directed to a helmet associated with the garment.
Official Gazette of the U.S. Patent and Trademark Office

N79-21766* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EMERGENCY SPACE-SUIT HELMET Patent
Harvey A. Smith, inventor (to NASA) (United Aircraft Corp., E. Hartford, Conn.) Issued 2 Jun. 1970 4 p Filed 24 Feb. 1966 Sponsored by NASA
(NASA-Case-XMS-04673-1; US-Patent-3,514,785; US-Patent-Appl-SN-529884; US-Patent-Class-2-2.1) Avail: US Patent and Trademark Office CSCL 06B

A collapsible, automatically extensible, emergency space helmet is described. The unit when deflated is carried on the back of the wearer, attached to the suit, so as not to interfere with normal activities. When inflated, the head of the wearer is completely incapsulated. F.O.S.

N79-21767 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN ADAPTIVE CONTROLLER WHICH DISPLAYS HUMAN OPERATOR LIMITATIONS FOR A FIGHTER TYPE AIRCRAFT Ph.D. Thesis
Eric Kent Lindberg 1978 301 p
Avail: Univ. Microfilms Order No. 7908879

A general adaptive controller which displays human operation limitations is developed for a fighter type aircraft flying a dynamic trajectory by using the total airframe-control system perturbation equations. The adaptive controller is implemented using a forced separation controller with limitations. The mathematical outcome is an adaptive forced separation controller which is flexible enough that it can be implemented on any aircraft control problem as long as the trajectory can be specified. The stability of the closed loop system employing such a controller is demonstrated on an example using the longitudinal axis of a fighter type aircraft. Analysis and synthesis techniques for the time varying aircraft model dynamics are demonstrated. The outcome is the evolution of a method for analyzing total aircraft/controller response to perturbations on a general trajectory. Dissert. Abstr.

N79-21768*# National Aeronautics and Space Administration, Washington, D. C.
UTILIZATION OF THE WASTES OF VITAL ACTIVITY
B. G. Gusarov, Yu. A. Drigo, V. M. Novikov, N. M. Samsonov, N. S. Farafonov, S. V. Chizhov, and V. I. Yazdovskiy Feb. 1979 49 p refs Transl. into ENGLISH from the book "Problemy Sozdaniya Zamkhutykh Ekologicheskikh Sistem" Moscow, Nauka Press, 1967 p 141-170 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75410) Avail: NTIS HC A03/MF A01 CSCL 06K

The recycling of wastes from the biological complex for use in life-support systems is discussed. Topics include laboratory equipment, heat treatment of waste materials, mineralization of waste products, methods for production of ammonium hydroxide and nitric acid, the extraction of sodium chloride from mineralized products, and the recovery of nutrient substances for plants from urine. Author

N79-21769*# Rice Univ., Houston, Tex. Dept. of Chemical Engineering.
TRACE CONTAMINANT STUDIES OF HSC ADSORBENT M.S. Thesis
Dennis Tzyy-nian Yieh Dec. 1978 78 p refs
(Contract NAS9-11827)
(NASA-CR-160148) Avail: NTIS HC A05/MF A01 CSCL 06K

The adsorption and desorption of fifteen trace contaminants on HSC (polyethylenimine coated acrylic ester) adsorbent were experimentally investigated with the following two objectives: to test the removal potential and the adsorption reversibility of the selected trace contaminants, and to test the effect a preadsorbed trace contaminant has on the CO2 adsorption capacity. The experimental method for acquiring the adsorption equilibrium data used is based on the volumetric (or displacement) concept of vacuum adsorption. From the experimental results, it was found that the HSC adsorbent has good adsorption potential for contaminants of alcohol compounds, esters, and benzene compounds; whereas, adsorption of ketone compounds, oxidizing and reducing agents are detrimental to the adsorbent. In addition, all liquid contaminants reduce the CO2 capacity of HSC adsorbent. F.O.S.

N79-21770# Naval Postgraduate School, Monterey, Calif.
A PRELIMINARY INVESTIGATION OF AURAL INPUT/OUTPUT SYSTEMS FOR IN-FLIGHT INFORMATION RETRIEVAL M.S. Thesis
Albert George Mertz Sep. 1978 164 p refs
(AD-A063174) Avail: NTIS HC A08/MF A01 CSCL 17/2

An analysis of two commercially available Speech Understanding Systems (SUS) was conducted. Each system was tested against various background noise conditions. Results obtained were compared with current criteria for SUS application in aircraft. Additionally, since the P-3 Orion aircraft is being considered as a SUS test aircraft, a survey of Fleet P-3 pilots was conducted. Their opinion was sought on what a SUS equipped microprocessor should be capable of accomplishing as an aid to the flight crew. Author (GRA)

N79-21771# Army Cold Regions Test Center, Fort Greely, Ark.
MAN AND MATERIEL IN THE COLD REGIONS, PART 1
Jun. 1978 69 p refs
(AD-A063752) Avail: NTIS HC A04/MF A01 CSCL 15/7

In 25 years of testing all classes of military materiel under the operational conditions of cold regions, the U.S. Army Cold Regions Test Center has amassed a unique store of experience. This brochure has been prepared to summarize portions of this experience, and to present attendant requirements and doctrine needed for successful military operations in cold regions. Later sections of this text will develop in detail the conditions that are unique to this theater of operation. It is, however, important at the start to define what is meant by cold regions, i.e., the physical and geographic parameters. An example of a principal physical parameter is, of course, ambient air temperature. The unique manifestations of precipitation, land surface, vegetation, etc., that are also of critical importance are largely derivative from the prevailing temperature. GRA

N79-21772# Army Communications Research and Development Command, Fort Monmouth, N. J.
MODELING AND ANALYSIS OF MAN-MACHINE INTERFACE INFORMATION Final Technical Report
Richard J. DAccardi Jul. 1978 89 p refs
(AD-A063515; CORADCOM-78-5) Avail: NTIS HC A05/MF A01 CSCL 17/2

Considering the premise that communications systems are

composed of electronic equipment, environmental effects, and the human element, one becomes aware of the difficulty in assuming knowledge of every aspect of a system. In modeling or analyzing a system, one should characterize each facet of the system separately by defining the most influential factors as stochastic variables and then proceed to estimate parameters and structure statistical models of operational efficiency. One example of a non-stationary physical process that influences communications systems is derived from the response of a systems operator to various levels of environmental stress. Due to the random nature of this phenomenon, two logical approaches to forecasting and interpreting experimental results with respect to operator performance seems to lie within the realms of non-linear modeling and non-stationary time-series modeling. The main objectives of this report are as follows: (1) The design of a statistical experiment is presented for man-machine interface studies aimed at the standard teletypewriter terminal and the optical display terminal. The structuring of this experiment includes time dependent and time independent formulations. (2) Various classical and non-parametric statistical analyses are presented which provide insight as to what degree the environmental variables of ambient light and acoustic noise affect operator response. (3) Two statistical models have been proposed for the analysis and interpretation of man-machine interface data. A time-independent structuring is presented for predicting errors as a function of environmental variables, and an optimal scheme is given for the determination of the errors. GRA

N79-21773# Dynamic Science, Phoenix, Ariz.
TEST AND EVALUATION OF HEAD RESTRAINTS, SEAT BACKS, AND ANCHORAGES IN VEHICLES SUBJECTED TO REAR IMPACT COLLISION Final Report, Jan. 1978 - Mar. 1978
R. Pirtle Jun. 1978 182 p
(Contract DOT-HS-8-01886)
(PB-289779/1; DOT-HS-803671) Avail: NTIS HC A09/MF A01 CSCL 13L

A series of car-to-car crash tests was conducted primarily for fuel system integrity. These tests were additionally instrumented to allow for the collection of baseline data in other areas. Baseline data collected during twelve of these tests is documented with regard to head restraint, seat back, and anchorage performance in rear impact collisions. The struck vehicle in these tests was equipped with an instrumented 50th percentile male dummy located in the driver's seat, string potentiometers, and high-speed on-board motion pictures to document driver's seat and seat back motion, and vehicle frame accelerometers to record the occupant compartment response. A comparison between component failure/yield and causative forces is presented. The driver seat backs in all but one test were deformed from their initial pre-test condition. GRA

N79-21774# National Academy of Sciences - National Research Council, Washington, D. C. Assembly of Life Science.
EVALUATION OF RESEARCH ON SURROGATES FOR HUMANS IN MOTOR VEHICLE CRASHES Final Report, Apr. - Jun. 1978
Jun. 1978 55 p refs
(Contract DOT-HS-8-01948)
(PB-291012/3; DOT-HS-803707) Avail: NTIS HC A04/MF A01 CSCL 13L

A review of the current status of automobile crash research utilizing cadavers, volunteers, animals, and models was conducted. The aim of the review was to determine the necessity for utilization of cadavers in such research. All viable alternatives were examined and it was the unanimous view of the committee that the National Highway Traffic Safety Administration could not develop essential information for crash safety rulemaking without resorting to the use of cadavers in certain types of crash research. GRA

N79-21775# Minicars, Inc., Goleta, Calif.
DEVELOPMENT OF A SOLID PROPELLANT INFLATION TECHNIQUE FOR THE SUBCOMPACT CAR PASSENGER RESTRAINT SYSTEM, PHASE 1 Final Report, 1 Jul. 1978 - Oct. 1978
Michael Fitzpatrick Oct. 1978 134 p
(Contract DOT-HS-6-01384)
(PB-290328/4; DOT-HS-803670) Avail: NTIS HC A07/MF A01 CSCL 13F

A passenger air cushion system pyrotechnically inflated and used with a mechanical knee restraint system in an effort to provide acceptable 45 mph performance for a broad range of occupant sizes (from the 6-yr-old child to the 50th percentile adult male) and natural siting positions. Progress toward this objective was achieved through sled tests in which the system was gradually developed and finalized. GRA

N79-21776# Calspan Corp., Buffalo, N. Y.
PERFORMANCE EVALUATION OF TEST DUMMIES WITH FLESH PARTS PRODUCED WITH SUBSTITUTE FOAMING COMPOUNDS Final Report, Mar. 1977 - Jul. 1978
Daniel E. Massing and Kenneth N. Naab Jul. 1978 191 p refs
(Contract DOT-HS-6-01514)
(PB-289951/6; CALSPAN-ZM-6015-V-1; DOT-HS-803711)
Avail: NTIS HC A09/MF A01 CSCL 05E

The objective of the research effort was to determine if Part 572 anthropomorphic dummy component flesh parts molded with Nitrosan and with alternate foaming materials designated as Compound A and Compound B resulted in different performance characteristics. Component and sled tests were performed with pairs of Part 572 dummies made by each of the three current U.S. manufacturers of these devices. The findings of a statistical study of repeatability and reproducibility of sled test results are presented wherein comparisons are made between dummies assembled with flesh parts made with Nitrosan and with either Compound A or Compound B. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N79-21777*# National Aeronautics and Space Administration, Washington, D. C.
PUBLICATIONS OF THE PLANETARY BIOLOGY PROGRAM FOR 1977: A SPECIAL BIBLIOGRAPHY
Linda G. Pleasant, comp. and Richard S. Young, comp. Apr. 1979 36 p
(NASA-TM-80338) Avail: NTIS HC A03/MF A01 CSCL 03B

List of 1977 publications resulting from research under the auspices of NASA's Planetary Biology Program. Author

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N79-21778 Northwestern Univ., Evanston, Ill.
AN ANALYSIS OF THE INFORMATION PRESERVING PROPERTIES OF RELATIONAL DATABASE TRANSFORMATIONS Ph.D. Thesis
Adarsh Kumar Arora 1978 86 p
Avail: Univ. Microfilms Order No. 7907848

The extent to which an important class of relational database transformations preserves information was examined. A formal

characterization of information content based on the set of functional and nonfunctional associations among attributes of a relational database are reported. Formal conditions are presented indicating the extent to which these associations are presented. The information preserving properties of several well-known relational transformations are described. Some problems in maintaining these properties under updates are discussed.
Dissert. Abstr.

N79-21779 California Univ., Los Angeles.
COORDINATION IN DISTRIBUTED SYSTEMS: CONCURRENCY, CRASH RECOVERY AND DATABASE SYNCHRONIZATION Ph.D. Thesis
Daniel Alberto Menasce 1978 307 p
Avail: Univ. Microfilms Order No. 7907674

A locking protocol to coordinate access to a distributed database and to maintain system consistency throughout normal and abnormal conditions is presented. The protocol is robust in the face of failures of any participating site and in the face of network partitioning. Recovery is done in such a way that maximum forward progress is achieved. The proposed protocol supports the integration of virtually any locking discipline including predicate locking methods. A cost and delay analysis of the protocol reveals that its performance does not depend on the size of the network for most topologies of interest. The protocol is formally described using state transition diagrams and a proof of its correctness is included. A proposal for an extension aimed at optimizing operation of the protocol to adapt to highly skewed distributions of activity is also presented. Dissert. Abstr.

N79-21780*# Louisville Univ., Ky. Dept. of Electrical Engineering.
MICROPROCESSOR REALIZATIONS OF RANGE RATE FILTERS Final Report
28 Feb. 1979 216 p refs
(Contract NAS9-15347)
(NASA-CR-160157) Avail: NTIS HC A10/MF A01 CSCL 09B

The performance of five digital range rate filters is evaluated. A range rate filter receives an input of range data from a radar unit and produces an output of smoothed range data and its estimated derivative range rate. The filters are compared through simulation on an IBM 370. Two of the filter designs are implemented on a 6800 microprocessor-based system. Comparisons are made on the bases of noise variance reduction ratios and convergence times of the filters in response to simulated range signals. S.E.S.

N79-21781*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ORBITER DATA REDUCTION COMPLEX DATA PROCESSING REQUIREMENTS FOR THE OFT MISSION EVALUATION TEAM (LEVEL C)
Mar. 1979 120 p Revised
(NASA-TM-79943; JSC-12750-Rev-B) Avail: NTIS HC A06/MF A01 CSCL 09B

This document addresses requirements for post-test data reduction in support of the Orbital Flight Tests (OFT) mission evaluation team, specifically those which are planned to be implemented in the ODRC (Orbiter Data Reduction Complex). Only those requirements which have been previously baselined by the Data Systems and Analysis Directorate configuration control board are included. This document serves as the control document between Institutional Data Systems Division and the Integration Division for OFT mission evaluation data processing requirements, and shall be the basis for detailed design of ODRC data processing systems. L.S.

N79-21782# Questron Corp., San Diego, Calif.
RADIATION HARDENED MICROPROCESSOR, VOLUME 1 Final Report, Oct. 1976 - Dec. 1977
V. V. Nickel and P. A. Rosenberg May 1978 380 p 2 Vol.
(Contract F33615-77-C-1001)
(AD-A063003; AFAL-TR-78-55-Vol-1) Avail: NTIS HC A17/MF A01 CSCL 09/2

Functional capabilities of a CMOS/SOS LSI device family for emulation usage were assessed. The device family consists of an 8-bit processor bit slice called the general processor unit (GPU), a 1024-bit read only memory (ROM) and a Universal Array (GUA) device with approximately 300 gates. The devices were analyzed in detail and deficiencies in their designs are itemized. Recommendations for changes are made to improve the emulation capabilities of the device family. Radiation hardening characteristics of the GPU, ROM and GUA are assessed in relation to their usage in emulating existing microcomputers and mini-computers. A complete functional specification is provided for the GPU. During this effort, the GPU design was verified utilizing low cost, functional testing techniques developed specially for LSI design validation. The key to low cost, functional testing is the automatic generation of test vectors. Several faults, detected in the GPU, are itemized in the report. A top level throughput characterization was also performed on the GPU. To the emulation capabilities of the devices, a design of an 8080 microprocessor emulator, using the CMOS/SOS device family, was completed. Hardware and firmware requirements for the emulator are determined to measure emulation efficiency and a throughput comparison is made between the emulator and the actual 8080. GRA

N79-21783# Questron Corp., San Diego, Calif.
RADIATION HARDENED MICROPROCESSOR, VOLUME 2 Final Report, Oct. 1976 - Dec. 1977
V. V. Nickel and P. A. Rosenberg May 1978 306 p refs 2 Vol.
(Contract F33615-77-C-1001)
(AD-A063004; AFAL-TR-78-55-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 09/2

The basic conclusion of this emulation analysis effort is that the GPU and its supporting devices (GUA, ROM and RAM) constitute a viable microprocessor bit slice device family. However, deficiencies were found in the GPU and its family members that must be rectified to ensure a truly competitive product line capable of handling Air Force requirements. GPU design deficiencies are presently being corrected. Deficiencies in the breadth of the device family were also found to exist and recommendations for additional part types for the family are proposed. The most important additional device type required is a microprogram controller. Building a CMOS/SIS version of the AMD 2910 is recommended. A parallel effort was undertaken to define and design, to the gate level, a particular computer for emulation using the device family. This effort provided a test of the emulation capabilities of the device family. Further deficiencies in the devices were found as a result of this effort. The computer selected for emulation was the 8080--a microprocessor representative of the higher performance microprocessors on the market. A major accomplishment of this program was the detailed design of an 8080 emulator using the device family. GRA

N79-21784# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
PDP-11 MICROCOMPUTER TEST STAND Final Report, 1 Jul. 1975 - 31 Mar. 1978
Dieter J. Schiller Sep. 1978 63 p
(AF Proj. 2003)
(AD-A061675; AFAL-TR-78-191) Avail: NTIS HC A04/MF A01 CSCL 09/2

The interface described in this report permits a Digital Equipment Corporation PDP-11 computer to control and monitor up to four separate microcomputers. The microcomputers execute their instructions out of the PDP-11 memory. Break point registers are included such that a print-out may be obtained of the microcomputer's register contents, etc., after execution of each instruction. Author (GRA)

N79-21785# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
DATA MODEL EQUIVALENCE
Sheldon A. Borkin Dec. 1978 38 p refs Presented at the 4th Intern. Conf. on Very Large Data Bases, West Berlin, Sep. 1978
(Contract N00014-75-C-0661)
(AD-A062753; MIT/LCS/TM-118) Avail: NTIS HC A03/MF A01 CSCL 05/2

The current proliferation of proposals for database system data models and the desire for database systems which support

several different data models raise many questions concerning equivalence properties of different data models. To answer these questions, one first needs clear definitions of of the concepts under discussion. This paper presents formal definitions of the terms database, operation operation type, application model and data model. Using this formal framework, database state equivalence, operation equivalence, application model equivalence and data model equivalence are distinguished. Three types of application and data model equivalence are defined -isomorphic, composed operation and state dependent. Possibilities for partial equivalences are mentioned. Implementation implications of these different equivalences are discussed. Examples are presented using two semantic data models, the semantic relation data model and the semantic graph data model. GRA

N79-21786# Virginia Polytechnic Inst. and State Univ., Blacksburg. Human Factors Lab.
INFORMATION TRANSFER FROM COMPUTER-GENERATED DOT-MATRIX DISPLAYS Final Report, 15 Sep. 1974 - 31 Aug. 1978
Harry L. Snyder and Michael E. Maddox Oct. 1978 293 p refs
(Grants DAHC04-74-G-0200; DAAG29-77-G-0200)
(AD-A063505; HFL-78-3/ARO-78-1; ARO-12355.7-EL) Avail: NTIS HC A13/MF A01 CSCL 05/8

This report summarizes a research program which has investigated the effects of numerous design parameters of alphanumeric dot-matrix displays upon operator performance. Among the parameters investigated experimentally are dot size, dot shape, dot contrast (or modulation), dot spacing, matrix size, character size, word context, ambient illuminance, character (dot) luminance, and character font. Operator performance in reading and search tasks was predicted by a linear regression model and subsequently cross-validated by additional experiments. Evaluations of several specific flat panel displays were made, with operator performance predicted acceptably from the previously derived regression model of display quality. Optimal capital alphanumeric fonts were determined for 5 x 7, 7 x 9, and 9 x 11 matrices. Author (GRA)

N79-21787# Office of Management and Budget, Washington, D. C. Information Systems Policy Div.
MAJOR DATA PROCESSING AND TELECOMMUNICATIONS ACQUISITION PLANS OF FEDERAL EXECUTIVE AGENCIES, FY 1979 - FY 1984
Jan. 1979 99 p
(PB-291592/4) Avail: NTIS HC A05/MF A01 CSCL 09B

The plans were developed by Federal executive agencies as a part of the FY 1980 budget process. Major acquisitions are defined as acquisitions having a system life cost of more than $1 million during FY 1979 through FY 1984. A one year exemption raising the $1 million to $5 million was granted to DOD. A complete definition of the plans included can be found in Section 43 of OMB Circular No. A-11 dated May 25, 1978. Resources for expanded or new capacity included in the plans were included in the President's FY 1980 budget request submitted to Congress. GRA

N79-21788# National Technical Information Service, Springfield, Va.
PARALLEL PROCESSORS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Dec. 1978
Brian Carrigan Feb. 1979 273 p Supersedes NTIS/PS-78/0016; NTIS/PS-77/0024
(NTIS/PS-79/0012/9; NTIS/PS-78/0016; NTIS/PS-77/0024) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

Federally-funded research on the design, development, and application of parallel processors are reported. Studies are included on the development of numerical techniques for parallel processing, scheduling parallel processors, and parallel processing of various kinds of scientific data. The development of algorithms and computer programs and specific studies on ILLIAC computer are presented. GRA

N79-21789# National Technical Information Service, Springfield, Va.
PARALLEL PROCESSORS, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1977-1978
Brian Carrigan Feb. 1979 169 p Supersedes NTIS/PS-78/0018; NTIS/PS-77/0025
(NTIS/PS-79/0013/7; NTIS/PS-78/0018; NTIS/PS-77/0025) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

On the design, development, and application of parallel processors are cited. Numerical techniques for parallel processing, scheduling parallel processors, and parallel processors, and parallel processing of various kinds of scientific data are developed. Algorithms, computer programs and ILLIAC computers are presented. This updated bibliography contains 164 abstracts, 77 of which are new entries to the previous edition. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N79-21790 Pennsylvania Univ., Philadelphia.
A STUDY OF INFERENCE FOR REGULAR BILANGUAGES Ph.D. Thesis
Joseph Berger 1978 202 p
Avail: Univ. Microfilms Order No. 7908708

The applicable binoid algebra and the more general problem of inference for the regular tree languages (or bilanguages) were reviewed. For this, the Gold concept of identification in the limit is extended to bilanguages, and an algebraic framework for the solution to the problem is given, first in terms of recognizers and then in terms of the generators (generalized context-free grammars) deduced from them. A computer program INFERGRAM, written PL/1, was developed and tested based on the theoretical results to permit the inference of grammars via three types of algorithms of increasing complexity and generality: context-independent, bounded local context-dependent, and adaptive (to structural patterns in the sample). Dissert. Abstr.

N79-21791 California Inst. of Tech., Pasadena.
A LANGUAGE PROCESSOR AND A SAMPLE LANGUAGE Ph.D. Thesis
Ronald Frederick Ayres 1979 440 p
Avail: Univ. Microfilms Order No. 7824369

A parser which efficiently handles general-rewrite grammars and a language processing system which supports semantic processing via independent rewrite grammars are presented. Each grammar represents a distinct aspect of the language. A given sequence of grammars becomes a sequence of passes, or process steps. Each pass derives a meaning with respect to one grammar and uses that meaning to generate phrases which will be interpreted by the next pass. Although linguistic specification is usually done with context-free grammars, features of this parser which support general-rewrite grammars are essential for the integration of passes. A general-purpose programming language called ICL which includes a simple and sate policy about pointers is implemented so that the user can ignore their existence completely if he wishes. Dissert. Abstr.

N79-21792 Maryland Univ., College Park.
THE INFLUENCE OF PROGRAMMING FACTORS ON PROGRAMMING COMPLEXITY Ph.D. Thesis
Hubert Earl Dunsmore 1978 153 p
Avail: Univ. Microfilms Order No. 7908849

It is possible for functionally-equivalent software to be nontrivially different. This research characterizes some sources of difference (called programming factors) and examines their effect on program construction difficulty (called programming complexity) in an Algol-like language family. The programming complexity measure employed is called program changes and is a count of contiguous statement changes made in a program from the initial to the final version. This algorithmic measure correlates well with total errors occurring in program construction. Dissert. Abstr.

N79-21793 Georgia Inst. of Tech., Atlanta.
AUTOMATIC ENCODING OF NATURAL LANGUAGE MEDICAL PROBLEMS Ph.D. Thesis

Martha Snyder Hansard 1978 192 p
Avail: Univ. Microfilms Order No. 7906829

The Anamnestic Coding Scheme, which originated to code signs and symptoms and has the potential for being a machine representation for all information in the medical record, to code the semantic content of problem-definitions was extended. A real-time, automatic encoder which maps problem-definitions stated in Natural Language into this semantic representation was designed and implemented on a medium size minicomputer. Results indicate automatic encoding of problem-definitions into the Anamnestic Coding Scheme is not only possible but beneficial for quality control. Dissert. Abstr.

N79-21794 Wisconsin Univ. - Madison.
THE DESIGN OF A PARALLEL PROGRAMMING LANGUAGE FOR ARTIFICIAL INTELLIGENCE APPLICATIONS Ph.D. Thesis
Masahiro Honda 1978 174 p
Avail: Univ. Microfilms Order No. 7823736

The problems of designing a parallel programming language for artificial intelligence (AI) applications were examined from the conflicting sets of requirements imposed by AI applications and parallel processing. AI applications require flexible access to data as well as flexible control over program flow. Such flexibility is difficult to provide in a parallel processing environment, where data access and program flow must be strictly controlled. A parallel base language, TOMO, was designed, TOMO modules are used to provide AI features found in TELOS, a recent AI language based on PASCAL. The module guard was conducted to act as a control abstraction mechanism providing complex inter-process control structures, including demons and pattern-directed invocation of processes. Guards can be used to implement complex forms of message passing, including addressing messages by pattern. Dissert. Abstr.

N79-21795 Iowa State Univ. of Science and Technology, Ames.
COMPILE TIME PREDICTION OF INTRINSIC PARALLELISM IN HIGH LEVEL PROGRAMS Ph.D. Thesis
C. Retnadhas 1978 199 p
Avail: Univ. Microfilms Order No. 7907278

Software simulation is used to study the impact of data flow processor in general purpose computing applications. Intrinsic parallelism and the cost of concurrent processing are used as measures in evaluating the performance of the data flow processor. To capture such measurements, the high level programs are translated to a data flow language and executed on the simulator. The ratio of sequential to parallel execution time for the entire program is defined as the intrinsic parallelism. The cost of concurrent processing, which consists of the data path, memory, and processor requirements along with the overhead required to maintain determinate and deadlock free computation, is obtained for minimum parallel execution time for a set of programs. The timed program graph model is introduced as an alternate method to obtain the system performance. Dissert. Abstr.

N79-21796 Pennsylvania Univ., Philadelphia.
AN INQUIRY DRIVEN COMPUTER VISION SYSTEM BASED ON VISUAL AND CONCEPTUAL HIERARCHIES Ph.D. Thesis
David Aaron Rosenthal 1978 314 p
Avail: Univ. Microfilms Order No. 7908786

Issues involved with the building of an interactive Computer Vision system which has the capability of locating user specified objects in a digitized image are discussed. The number of Image Processing operations used are minimized. The system tested is on a digitized, black/white aerial image of an urban area. A working system of a type that no one has built before was developed. Techniques that are powerful in this environment are demonstrated; specifically the interactions of the visual and conceptual hierarchy. S.E.S.

N79-21797 Brown Univ., Providence, R. I.
CONTOUR DATA COMPRESSION EXPLOITING CURVE-TO-CURVE DEPENDENCE Ph.D. Thesis
Nese Yalabik 1978 100 p
Avail: Univ. Microfilms Order No. 7906632

The along the curve compression is performed by the use of the cubic spline approximation. Additional compressibility achievable by exploiting curve to curve structural similarities is investigated. In particular, a predictive coding method where the behaviour of a contour is predicted by a linear transformation of an adjacent similar contour is reported. This transformation included a combination of curve translation, non-uniform scaling, and rotation operations about an arbitrary point. It is shown that a compression ratio of 1.5 to 2.5 above that achievable with the spline approximation to the individual curves is to be expected by the proposed system, assuming error free transmission of knot locations. Also shown is that this ratio can be improved twice if about 3% error in relocating the knots is allowed. Overall compression ratios found by comparison to the uncoded line scan vary with the quantization level. For the standard facsimile scan ratios of almost three orders of magnitude are obtained. Dissert. Abstr.

N79-21798*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERACTIVE DEBUG PROGRAM FOR EVALUATION AND MODIFICATION OF ASSEMBLY-LANGUAGE SOFTWARE
Dale J. Arpasi Apr. 1979 82 p refs
(NASA-TP-1441; E-9219) Avail: NTIS HC A05/MF A01 CSCL 09B

An assembly-language debug program written for the Honeywell HDC-601 and DDP-516/316 computers is described. Names and relative addressing to improve operator-machine interaction are used. Features include versatile display, on-line assembly, and improved program execution and analysis. The program is discussed from both a programmer's and an operator's standpoint. Functional diagrams are included to describe the program, and each command is illustrated. S.E.S.

N79-21799*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTERPRETIVE COMPUTER SIMULATOR FOR THE NASA STANDARD SPACECRAFT COMPUTER-2 (NSSC-2)
Rudeen S. Smith and Marie S. Noland Mar. 1979 58 p refs
(NASA-TM-80067) Avail: NTIS HC A04/MF A01 CSCL 09B

An Interpretive Computer Simulator (ICS) for the NASA Standard Spacecraft Computer-II (NSSC-II) was developed as a code verification and testing tool for the Annular Suspension and Pointing System (ASPS) project. The simulator is written in the higher level language PASCAL and implented on the CDC CYBER series computer system. It is supported by a metal assembler, a linkage loader for the NSSC-II, and a utility library to meet the application requirements. The architectural design of the NSSC-II is that of an IBM System/360 (S/360) and supports all but four instructions of the S/360 standard instruction set. The structural design of the ICS is described with emphasis on the design differences between it and the NSSC-II hardware. The program flow is diagrammed, with the function of each procedure being defined; the instruction implementation is discussed in broad terms; and the instruction timings used in the ICS are listed. An example of the steps required to process an assembly level language program on the ICS is included. The example illustrates the control cards necessary to assemble, load, and execute assembly language code; the sample program to to be executed; the executable load module produced by the loader; and the resulting output produced by the ICS. J.M.S

N79-21800*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTERP3: A COMPUTER ROUTINE FOR LINEAR INTERPOLATION OF TRIVARIATE FUNCTIONS DEFINED BY NONDISTINCT UNEQUALLY SPACED VARIABLES
Denise C. Hill and Shelby J. Morris, Jr. Mar. 1979 15 p
(NASA-TM-80070) Avail: NTIS HC A02/MF A01 CSCL 09B

A report on the computer routine INTERP3 is presented. The routine is designed to linearly interpolate a variable which is a function of three independent variables. The variables within the parameter arrays do not have to be distinct, or equally spaced, and the array variables can be in increasing or decreasing order. Author

N79-21801*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
USER'S GUIDE FOR THE CATE-LIEBIG LAW OF THE MINIMUM

D. E. Phinney and R. B. Cate Feb. 1979 53 p
(Contract NAS9-15800)
(NASA-CR-160161; LEC-12377; JSC-14790) Avail: NTIS HC A04/MF A01 CSCL 09B

The computer program used to implement the Cate-Liebig law-of-the-minimum algorithm for continuous data is described. Author

N79-21802*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

MATHEMATICAL DESCRIPTION AND PROGRAM DOCUMENTATION FOR CLASSY, AN ADAPTIVE MAXIMUM LIKELIHOOD CLUSTERING METHOD

R. K. Lennington and M. E. Rassbach (Elogic, Inc., Houston, Tex.) Apr. 1979 63 p ref
(Contract NAS9-15800)
(NASA-CR-160162; LEC-12177; JSC-14621) Avail: NTIS HC A04/MF A01 CSCL 09B

Discussed in this report is the clustering algorithm CLASSY, including detailed descriptions of its general structure and mathematical background and of the various major subroutines. The report provides a development of the logic and equations used with specific reference to program variables. Some comments on timing and proposed optimization techniques are included. Author

N79-21803# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

TARTAN LANGUAGE DESIGN FOR THE IRONMAN REQUIREMENT: REFERENCE MANUAL

Mary Shaw, Paul A. Hilfinger, and Wm. Wulf Jun. 1978 27 p
(Contract F44620-73-C-0074)
(AD-A062856; CMU-CS-78-133; AFOSR-78-1521TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Tartan is an experiment in language design. The goal was to determine whether a 'simple' language could meet substantially all of the ironman requirements for a common high-order programming language. This experiment was undertaken because it was believed that all the designs done in the first phase of the DOD effort were too large and too complex. That complexity was viewed as a serious failure of the designs; excess complexity in a programming language can interfere with its use, even to the extent that any beneficial properties are of little consequence. The researchers wanted to find out whether the requirements inherently lead to such complexity or whether a substantially simpler language would suffice. Three ground rules drove the experiment. First, no more than two months -April 1 to May 31 - would be devoted to the project. Second, the language would meet all the Ironman requirements except for a few points at which it would anticipate Steelman requirements. Further, the language would contain no extra features unless they resulted in a simpler language. Third, simplicity would be the overriding objective. It must be emphasized again that this effort is an experiment, not an attempt to compete with DOD contractors. Tartan is, however, an open challenge to the Phase 2 contractors: The language can be at least this simple. Can anyone do better. GRA

N79-21804# Yale Univ., New Haven, Conn. Dept. of Computer Science.

INTEGRATED PARTIAL PARSING

Roger C. Schank, Michael Lebowitz, and Lawrence A. Birnbaum Nov. 1978 67 p refs
(Contract N00014-75-C-1111)
(AD-A062638; RR-143) Avail: NTIS HC A04/MF A01 CSCL 05/7

A new type of natural language parser is presented. The idea behind this parser is to map input sentences into the deepest form of the representation of their meaning and inferences, as is appropriate. The parser is not distinct from an entire understanding system. It uses an integrated conception of inferences, scripts, plans, and other knowledge to aid in the parse. Furthermore, it does not attempt to parse everything it sees. Rather, it determines what is most interesting and concentrates on that, ignoring the rest. Author (GRA)

N79-21805# Analytical Systems Engineering Corp., Burlington, Mass.

MATHEMATICAL ANALYSIS AND SOFTWARE IMPLEMENTATION FOR PHYSICAL AND ENGINEERING DATA Final Report, 16 May 1978 - 30 Sep. 1978

Edward J. Ziemba, Andre LaCroix, John Crosby, Kathleen Lewis, and Peter Chin Nov. 1978 75 p
(Contract F19628-78-C-0157)
(AD-A062651; AFGL-TR-78-0254) Avail: NTIS HC A04/MF A01 CSCL 09/2

The purpose of this report is to describe most of mathematical analysis, data analysis, and computer programming problems performed under Contract No. F19628-78-C-0157. The problems vary in complexity from straight forward program adaptation to tasks requiring analysis, determining, implementing, and sometimes deriving algorithms best suited to perform the calculations. The problems are discussed in summary form and analysis and programming techniques required are outlined. It should be noted that most of these problems are a continuation of the efforts undertaken during the period of Contract No. F19628-77-C-0174. Author (GRA)

N79-21806# Massachusetts Inst. of Tech., Cambridge.

THE ART OF THE INTERPRETER OF THE MODULARITY COMPLEX (PARTS ZERO, ONE, AND TWO)

Guy Lewis Steele, Jr. and Gerald Jay Sussman May 1978 77 p refs
(Contract N00014-75-C-0643)
(AD-A062925; AI-M-453) Avail: NTIS HC A05/MF A01 CSCL 09/2

We examine the effects of various language design decisions on the programming styles available to a user of the language, with particular emphasis on the ability to incrementally construct modular systems. At each step we exhibit an interactive meta-circular interpreter for the language under consideration. Each new interpreter is the result of an incremental change to a previous interpreter. We explore the consequences of various variable binding disciplines and the introduction of side effects. We find that dynamic scoping is unsuitable for constructing procedural abstractions, but has another role as an agent of modularity, being a structured form of side effect. More general side effects are also found to be necessary to promote modular style. We find that the notion of side effect and the notion of equality (object identity) are mutually constraining; to define one is to define the other. The interpreters we exhibit are all written in a simple dialect of LISP, and all implement LISP-like languages. A subset of these interpreters constitute a partial historical reconstruction of the actual evolution of LISP. Author (GRA)

N79-21807# Massachusetts Inst. of Tech., Cambridge. Computer Science Lab.

OPERATIONAL SEMANTICS OF A DATA FLOW LANGUAGE M.S. Thesis

Jarvis Dean Brock Dec. 1978 59 p refs
(Contract N00014-75-C-0661; Grant NSF DCR-75-04060)
(AD-A062997; MIT/LCS/TM-120) Avail: NTIS HC A04/MF A01 CSCL 09/2

A data flow machine achieves high performance by the concurrent execution of machine code consisting of data flow graphs which explicitly represent the data dependencies among program instructions. This thesis presents the operational semantics of ADFL, an applicative data flow language with an iteration construct resembling tail recursion and an error-handling scheme appropriate to the concurrency of data flow. The operational semantics O dot J of ADFL are expressed by a two step process. The translation algorithm J maps an ADFL expression into its graph implementation, and the semantic function O maps the graph into its semantic characterization. Data flow graphs are specified by use of a graph assembly language, and the semantics of these graphs are derived by use of Kahn's fixpoint theory of communicating processes. Author (GRA)

N79-21808# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.

SOCIAL PROCESSES AND PROOFS OF THEOREMS AND PROGRAMS

Richard A. DeMillo, Richard J. Lipton, and Alan J. Perlis (Yale Univ., New Haven, Conn.) Aug. 1978 37 p refs Revised
(Grants DAAG29-78-G-0121; DAAG29-76-G-0338)
(AD-A063007; GIT-ICS-78/04) Avail: NTIS

HC A03/MF A01 CSCL 09/2

It has been extensively argued that the art and science of programming should strive to become more like mathematics. In this paper we argue that this point of view is correct, but that the reasons usually given for it are wrong. We present our view that mathematics is, rather than a formal process, an ongoing social process and that the formalistic view of mathematics is misleading and destructive for proving software. Author (GRA)

N79-21809# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.

AN APPROACH TO THE PROGRAMMING OF BASED REGRESSION ALGORITHMS Interim Report

Richard F. Gunst Nov. 1978 11 p refs

(Grant AF-AFOSR-2871-75; AF Proj. 2304)

(AD-A062774; AFOSR-78-1548TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Due to the near nonexistence of computer algorithms for calculating estimators and ancillary statistics that are needed for biased regression methodologies, many users of these methodologies are forced to write their own programs. Brute-force coding of such programs can result in a great waste of computer core and computing time, as well as inefficient and inaccurate computing techniques. This article proposes some guides to more efficient programming by taking advantage of mathematical similarities among several of the more popular biased regression estimators. GRA

N79-21810# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

THE IMPLEMENTATION AND EVALUATION OF PARALLEL ALGORITHMS ON C.MMP Interim Report

Peter N. Oleinick Nov. 1978 105 p refs

(Contracts N00014-77-C-0500; F44620-73-C-0074)

(AD-A063616; CMU-CS-78-151) Avail: NTIS HC A06/MF A01 CSCL 09/2

This dissertation demonstrates the implementation and evaluation of parallel algorithms on C.mmp, a multiprocessor computer system. Initial attempts to demonstrate the performance of a simple parellel algorithm yielded unexpectedly large performance degradations from the theoretical calculations. This unexpected result spawned a study of the C.mmp system to discover and measure the major sources that perturbed the performance of the parallel algorithm. The performance study was conducted at several levels: basic hardware measurements; runtime performance of Hydra, C.mmp's operating system; and overall performance of a particular application: a parallel rootfinding algorithm. The results of this study identified six major sources of performance perturbation. The six sources, in order of importance, were: variations in the compute time to perform the repetitive calculation; memory contention caused by finite memory bandwidth; the operating system's scheduling processes can become a bottleneck; variations in the individual processor speeds; interrupts associated with I/O device service routines; and variations in the individual memory bank speeds. GRA

N79-21811# Stanford Univ., Calif. Systems Optimization Lab.

COMPUTATIONAL EXPERIMENTS ON LARGE-SCALE OPTIMIZATION WITH DECOMPOSITION PRINCIPLE

Gerhard Schiefer (Kiel Univ., West Germany) Dec. 1978 48 p refs

(Contracts N00014-75-C-0267; EY-76-S-03-0326; Grants NSF MCS-76-20019; NSF ENG-77-06761; NSF MCS-76-81259) (AD-A063755; SU-SOL-78-33) Avail: NTIS HC A03/MF A01 CSCL 12/2

In this paper, the solution of large optimization problems for regional planning are traced out by a decomposition program that is based on the use of standard LP programs. The underlying method is the decomposition principle of Dantzig and Wolfe. The concept is tested by solving an optimization problem with about 1250 columns and 900 rows. Furthermore, it is investigated to what extent the efficiency of the solution procedure can be influenced by an appropriate choice of starting solutions or specific matrix divisions. GRA

N79-21812# Purdue Univ., Lafayette, Ind. Applied Industrial Control Lab.

THE PRESENT STATUS OF THE FIELD OF DIGITAL COMPUTER BASED INDUSTRIAL CONTROL SYSTEMS AND THE WORK OF THE INTERNATIONAL PURDUE WORKSHOP IN HELPING TO PROMOTE THIS FIELD Final Report, 1 Dec. 1977 - 30 Nov. 1978

Theodore J. Williams Sep. 1978 129 p refs

(Contract N00014-78-C-0127)

(AD-A063743; Rept-109) Avail: NTIS HC A07/MF A01 CSCL 05/8

This report comprises a review of the current state of the art of the application of computers to the control of industrial processes. Needs and progress in the development of hardware and software standards are described. Emphasis is given to the current trends toward hierarchical and distributed control systems. Author (GRA)

N79-21813# Stanford Univ., Calif. Systems Optimization Lab.

PROJECTED LAGRANGIAN METHODS BASED ON THE TRAJECTORIES OF PENALTY AND BARRIER FUNCTIONS

Walter Murray and Margaret H. Wright Nov. 1978 72 p refs

(Contracts N00014-75-C-0267; EY-76-S-03-0326; Grants NSF MCS-76-20019; NSF ENG-77-06761)

(AD-A063335; SU-SOL-78-23) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report contains a complete derivation and description of two algorithms for nonlinearly constrained optimization which are based on properties of the solution trajectory of the quadratic penalty function and the logarithmic barrier function. The methods utilize the penalty and barrier functions only as merit functions, and do not generate iterates by solving a sequence of ill-conditioned problems. The search direction is the solution of a simple, well-posed quadratic program (QP), where the quadratic objective function is an approximation to the Lagrangian function; the steplength is based on a sufficient decrease in a penalty or barrier function, to ensure progress toward the solution. The penalty trajectory algorithm was first proposed by Murray in 1969; the barrier trajectory algorithm, which retains feasibility throughout, was given by Wright in 1976. Here a unified presentation of both algorithms are given and indicate ions their relationship to other QP-based methods are also given. Full details of implementation are included, as well as numerical results that display the success of the methods on non-trivial problems. Author (GRA)

N79-21814# National Institutes of Health, Bethesda, Md. Div. of Computer Research and Technology.

PROJECT RMAG: SYMBOLIC LOGIC RETRIEVAL SOURCE CODE

Robert A. Magnuson Dec. 1978 183 p refs

(PB-289956/5; NIH-DCRT-DMB-SSS-AN506; NIH/DF-78/004A) Avail: NTIS HC A09/MF A01 CSCL 09B

The SLR generator, reading free-form specifications of the user's file structure, creates a customized IBM 370 COBOL program which interactively retrieves selected records from the user's file. The generated program permits its user to use sentential calculus schemata, existential and universal quantifiers, sophisticated arithmetic specification, the RMAG macrogenerator, and external macro libraries. The bulk of the work done by the generated program is accomplished by means of calls to standard subroutines including the RMAG macrogenerator logic subroutines, and arithmetic subroutine. The manual contains the source code from the various SLR modules giving the interested programmer the knowledge needed both to modify SLR and to write his own programs which interface with those standard subroutines. A companion manual tells how to generate and use SLR programs. GRA

N79-21815# National Institutes of Health, Bethesda, Md. Div. of Computer Research and Technology.

PROJECT RMAG: SYMBOLIC LOGIC RETRIEVAL, USERS GUIDE

Robert A. Magnuson Dec. 1978 107 p refs

(PB-289957/3; NIH-DCRT-DMB-SSS-UG104; NIH/DF-78/004B) Avail: NTIS HC A06/MF A01 CSCL 09B

The SLR generator, reading free-form specifications of the user's file structure, creates a customized IBM 370 COBOL program which interactively retrieves selected records from the

user's file. This manual shows the reader how to use and generate SLR programs. A companion manual shows the source code involved giving the interested reader the knowledge necessary to modify SLR or to write his own programs which interface with those standard subroutines. GRA

N79-21816# New York Univ., N. Y. Linguistics String Project.
INFORMATION STRUCTURES IN THE LANGUAGE OF SCIENCE: THEORY AND IMPLEMENTATION Final Report, 1 Nov. 1975 - 21 Oct. 1977
Naomi Sager and Lynette Hirschman Sep. 1978 187 p refs (Grant NSF SIS-75-22945)
(PB-289949/0) Avail: NTIS HC A09/MF A01 CSCL 09B

The results of an investigation into the relation between language structure and information, particularly as it appears in the language of science, and into whether the regularities observed in the language material can be used as the basis for computer programs for processing the information in natural language file documents are presented. The syntactic and statistical methods used in the research can be applied with little change to written material from many sciences. It was shown that a computer program can convert documents in a restricted subject matter into a table-like structure (called an information format) which contains the same information as the input documents. No textual information is lost and the original sentences or paraphrases of them can be reconstructed from the table. The main practical implication is that large files of documents on a given subject could be queried or summarized without coding or altering the input natural language documents. GRA

N79-21817# Victoria Univ. (British Columbia).
EFFECTIVENESS OF PROGRAM VALIDATION METHODS FOR SCIENTIFIC PROGRAMS Final Report
William E. Howden 1978 206 p refs
(Contract NBS-7-35846)
(PB-289930/0; NBS-GCR-78-148) Avail: NTIS HC A10/MF A01 CSCL 09B

The results of an investigation of the effectiveness of different software validation techniques. The investigation involved two types of activities which are described. Software validation methods and of previous studies of effectiveness were surveyed. A project in which each of the errors in a collection of scientific programs was carefully analyzed to determine which validation method would be most useful in preventing the error from occurring is developed. GRA

N79-21818# National Technical Information Service, Springfield, Va.
DATA BASE LANGUAGES. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jan. 1979
Brian Carrigan Feb. 1979 65 p Supersedes NTIS/PS-78/0012
(NTIS/PS-79/0004/6; NTIS/PS-78/0012) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

Query languages, data definition languages, data manipulation languages, and data dictionary/directories were studied. References are made to the CODASYL standard, as well as to many other data bases. The data elements of data bases applied to a variety of areas are described. This updated bibliography contains 60 abstracts 20 of which are new entries to the previous edition. GRA

N79-21990# Joint Publications Research Service, Arlington, Va.
AN AUTOMATED SYSTEM FOR PREPARING MINICOMPUTER SOFTWARE
Ye. I. Belyavskiy, A. F. Kapoyko, and I. A. Sennius *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 63 (JPRS-73084) 26 Mar. 1979 p 19-25 refs Transl. into ENGLISH from Upravlyayushchiye Sistemy i Mashiny (Kiev), no. 5, Sep./Oct. 1978 p 54-57 (For primary document see N79-21989 12-99)
Copyright. Avail: NTIS HC A04/MF A01

N79-21991# Joint Publications Research Service, Arlington, Va.
AUTOMATED PROGRAMMING SYSTEMS FOR MICROCOMPUTERS DISCUSSED
Yu. V. Ivanov, Yu. A. Maslenikov, N. Ye. Chebykin, A. V. Shebarin, and I. V. Shturts *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 63 (JPRS-73084) 26 Mar. 1979 p 26-31 refs Transl. into ENGLISH from Upravlyayushchiye Sistemy i Mashiny (kiev), no. 5, Sep./Oct. 1978 p 39-42 (For primary document see N79-21989 12-99)
Copyright. Avail: NTIS HC A04/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N79-21819 New York Univ., N. Y. Mathematics and Computing Lab.
THE STRUCTURE OF THE PUMA COMPUTER SYSTEM: OVERVIEW AND THE CENTRAL PROCESSOR
Ralph Grishman Nov. 1978 80 p
(Contract EY-76-C-02-3077)
(COO-3077-157) Copyright. Avail: NTIS HC A05

The chronology of the PUMA project is presented. The PUMA system and the central processor at the microprogram and register level are described. The microprogramming language of PUMA is discussed. The microprogram for the Central Data 6600 is reported. S.E.S.

N79-21820 Carnegie-Mellon Univ., Pittsburgh, Pa.
PERFORMANCE EVALUATION AT THE HARDWARE ARCHITECTURE LEVEL AND THE OPERATING SYSTEM KERNEL DESIGN LEVEL Ph.D. Thesis
Madhav Vinayak Marathe 1978 183 p
Avail: Univ. Microfilms Order No. 7807188

The space of performance parameters of various system levels for complex computers is examined and strengths of the various measurement tools are discussed with respect to the parameters. The hardware monitor was identified as the primary measurement tool at the levels of hardware architecture and operating system kernel design. Because the hardware monitor is a versatile tool applicable to other levels as well, many other applications of the hardware monitor were investigated but to lesser depths. A survey of hardware monitoring techniques is presented and suggestions are made regarding the design of future monitors. Dissert. Abstr.

N79-21821 State Univ. of New York, Binghamton.
COMPUTER-AIDED SYSTEMS MODELLING: AN ASSEMBLAGE OF METHODOLOGICAL TOOLS FOR SYSTEMS PROBLEM SOLVING Ph.D. Thesis
Hugo Jozef Julien Uyttenhove 1979 294 p
Avail: Univ. Microfilms Order No. 7907002

Systems modelling represents a class of problems which are centered at the heart of systems problem solving. The aspects of systems modelling are investigated on computer software in an interactive mode with the human modeller such that both complement each other in a symbiotic fashion. A theoretical background relating to the supporting conceptual framework is described and the applicability of the developed software methodological tools is demonstrated. Systems are characterized in terms of a hierarchy of epistemological levels and the types of problems which represent transitions from one level of systems to the same or higher levels. For each such transition in the hierarchy, a number of algorithms were developed. The described algorithms were tested by means of numerous simulation experiments, the results of which are summarized, as well as by some real-world modelling problems in the fields of aviation and ecology. Dissert. Abstr.

N79-21822*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASF TRANSPOSITION NETWORK: A COMPUTING NETWORK FOR UNSCRAMBLING p-ORDERED VECTORS
Raymond S. Lim Apr. 1979 37 p refs
(NASA-TP-1426; A-7645) Avail: NTIS HC A03/MF A01 CSCL 09B

The viewpoints of design, programming, and application of

the transportation network (TN) is presented. The TN is a programmable combinational logic network that connects 521 memory modules to 512 processors. The unscrambling of p-ordered vectors to 1-ordered vectors in one cycle is described. The TN design is based upon the concept of cyclic groups from abstract algebra and primitive roots and indices from number theory. The programming of the TN is very simple, requiring only 20 bits: 10 bits for offset control and 10 bits for barrel switch shift control. This simple control is executed by the control unit (CU), not the processors. Any memory access by a processor must be coordinated with the CU and wait for all other processors to come to a synchronization point. These wait and synchronization events can be a degradation in performance to a computation. The TN application is for multidimensional data manipulation, matrix processing, and data sorting, and can also perform a perfect shuffle. Unlike other more complicated and powerful permutation networks, the TN cannot, if possible at all, unscramble non-p-ordered vectors in one cycle. S.E.S.

N79-21823# Arizona Univ., Tucson. Dept. of Chemistry.
NOVEL MICROCOMPUTER-CONTROLLED POTENTIOMETRIC ANALYSIS SYSTEM Technical Report, 1 Apr. 1978 - 31 Dec. 1978
Charles Martin and Henry Freiser 5 Jan. 1979 26 p refs
(Contract N00014-78-C-0001)
(AD-A063238; TR-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

A novel microcomputer-controlled potentiometric analysis system is described. This system combines the low cost and ease of construction advantages of microcomputer-based instrumentation with the high level software capabilities of a minicomputer. This is made possible through the use of a powerful new computer language called CONVERS. The instrumentation and CONVERS software system are described. Applications of this system to endpoint determination in potentiometric titrations and fully automated generation of calibration curve data for multiple ion selective electrodes are described. Modification and extension of the current hardware and software to permit automation of other potentiometric methods are discussed.
Author (GRA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N79-21824 Idaho Univ., Moscow.
DEVELOPMENT OF CONTIGUUM FINITE ELEMENT TRANSIENT NONLINEAR HEAT CONDUCTION Ph.D. Thesis
Hal Gene Kraus 1978 220 p
Avail: Univ. Microfilms Order No. 7904861

A new type of thermal finite element called a contiguum element, and the associated numerical solution procedure to enable its use with common thermal finite element methods (FEM) were developed. A two-dimensional, nonlinear, steady state and transient conduction heat transfer in Cartesian coordinates is examined. One- and two-dimensional steady state and transient heat conduction problems were solved using contiguum elements. Results of these examples were compared to corresponding analytical and FEM solutions without use of contiguum element method are discussed. The advantages and disadvantages of the two-dimensional contiguum element are given. Dissert. Abstr.

N79-21825 Brown Univ., Providence, R. I.
APPROXIMATION AND OPTIMAL CONTROL OF LINEAR HEREDITARY SYSTEMS Ph.D. Thesis
Douglas Christian Reber 1978 77 p
Avail: Univ. Microfilms Order No. 7906602

The approximation and optimal control of systems governed by linear retarded functional differential equations (FDE) were investigated. The existence, uniqueness, and continuous dependence of solutions of FDE are established. Certain FDE are equivalent to corresponding abstract ordinary differential equations are described. The optimal control problem for systems governed by FDE is then reduced to a sequence of mathematical programming problems. Numerical results for two systems, having applied standard techniques of numerical analysis to compute the solutions of the approximating problems are discussed.
Dissert. Abstr.

N79-21826 Columbia Univ., New York.
SHUTTLE SYSTEMS WITH ONE CARRIER AND TWO PASSENGER QUEUES Ph.D. Thesis
Irith Malka Dror 1978 108 p
Avail: Univ. Microfilms Order No. 7908593

Transportation systems that can be modeled as controlled queues and analyzed by Markovian Decision processes are presented. Optimal dispatching policies were examined for the following shuttle systems: (1) A one-terminal one-carrier system with two classes of customers; (2) A two-terminals one-carrier system with a single class of customers. Dissert. Abstr.

N79-21827*# Lockheed Electronics Co., Edison, N. J. Systems and Services Div.
THE MEAN-SQUARE ERROR OPTIMAL LINEAR DISCRIMINANT FUNCTION AND ITS APPLICATION TO INCOMPLETE DATA VECTORS
H. F. Walker Feb. 1979 36 p refs
(Contract NAS9-15800)
(NASA-CR-160134; JSC-12696; LEC-12773) Avail: NTIS HC A03/MF A01 CSCL 09B

In many pattern recognition problems, data vectors are classified although one or more of the data vector elements are missing. This problem occurs in remote sensing when the ground is obscured by clouds. Optimal linear discrimination procedures for classifying imcomplete data vectors are discussed. S.E.S.

N79-21828*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ON RELIABLE CONTROL SYSTEM DESIGNS WITH AND WITHOUT FEEDBACK RECONFIGURATIONS Interim Report
John Douglas Birdwell, D. A. Castanon, and M. Athans 1978 10 p refs
(Grants NGL-22-009-124; AF-AFOSR-3281-77)
(NASA-CR-158409; AD-A062697; LIDS-P-861; AFOSR-78-1542TR) Avail: NTIS HC A02/MF A01 CSCL 12A

This paper contains an overview of a theoretical framework for the design of reliable multivariable control systems, with special emphasis on actuator failures and necessary actuator redundancy levels. Using a linear model of the system, with Markovian failure probabilities and quadratic performance index, an optimal stochastic control problem is posed and solved. The solution requires the iteration of a set of highly coupled Riccati-like matrix difference equations; if these converge one has a reliable design; if they diverge, the design is unreliable, and the system design connot be stabilized. In addition, is is shown that the existence of a stabilizing constant feedback gain and the reliability of its implementation is equivalent to the convergence properties of a set of coupled Riccati-like matrix difference equations. In summary, these results can be used for off-line studies relating the open loop dynamics, required performance, actuator mean time to failure, and functional or identical actuator redundancy, with and without feedback gain reconfiguration strategies.
Author (GRA)

N79-21829# Yale Univ., New Haven, Conn. Dept. of Computer Science.
MICRO-SAM AND MICRO-ELI EXERCISES IN POPULAR COGNITIVE MECHANICS
Christopher K. Riesbeck and Eugene Charniak Sep. 1978 72 p
(Contract N00014-75-C-1111)
(AD-A062731; RR-139) Avail: NTIS HC A08/MF A01 CSCL 06/4

This report contains a detailed description--plus all the LISP code--of a miniature versions of well-known natural language understanding programs: SAM, Script Applying Mechanism, and ELI, English Language Interpreter. The programs are intended to be simple enough so that interested computer scientists and psychologists, with only an introductory knowledge of LISP, can

understand, modify, and extend programs dealing with knowledge structure based understanding. Author (GRA)

N79-21830# Texas Univ. at Austin. Electronics Research Center.

SYNTHESIS OF FEEDBACK SYSTEMS WITH NONLINEAR UNCERTAIN PLANTS

Baxter F. Womack and Wo Lo Hin Mar. 1978 7 p refs Presented at IEEE Region 5 Ann. Conf., 1978

(Contract F49620-77-C-0101)

(AD-A062760; AFOSR-78-1570TR) Avail: NTIS HC A02/MF A01 CSCL 09/3

A synthesis theory for feedback systems with nonlinear uncertain plants to satisfy prescribed output tolerances is presented. The essence of the theory is to convert the nonlinear plant set to a linear time-invariant one for which a design procedure exists. Schauder's fixed point theorem is applied to prove the equivalence of these two plant sets. GRA

N79-21831# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

A FUNCTIONAL EXPANSION APPROACH TO THE SOLUTION OF NONLINEAR FEEDBACK SYSTEMS

Ram-Nandan P. Singh and Timothy L. Johnson Oct. 1978 8 p refs Presented at CDC, San Diego, Calif., Jan. 1979

(Grants AF-AFOSR-3281-77; NSF 77-05200; NSF 77-2844)

(AD-A062773; ESL-P-796; AFOSR-78-1546TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper presented two results: a new structure for the solution of nonlinear analytic systems, and an application of Bellman's Fundamental Technique to obtain the sub-optimal-feedback control of a class of quasilinear systems with non-quadratic performance indices. The application of the Fundamental Technique with a nonlinear auxiliary equation is shown to result in higher order approximating equations which are linear. Using the method by separation of variables, two examples are solved. Author (GRA)

N79-21832# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

NON-MONOTONIC LOGIC I

Drew McDermott (Yale University, New Haven, Conn.) and Jon Doyle Aug. 1978 40 p refs

(Contract N00014-75-C-0643; NSF MCS-77-04828)

(AD-A062813; AI-M-486) Avail: NTIS HC A03/MF A01 CSCL 06/4

Non-monotonic logical systems are logics in which the introduction of new axioms can invalidate old theorems. Such logics are very important in modeling the beliefs of active processes which, acting in the presence of incomplete information, must make and subsequently revise predictions in light of new observations. The motivation and history of such logics are presented. Model and proof theories, a proof procedure, and applications for one important non-monotonic logic are developed. In particular, the completeness of the non-monotonic predicate calculus and the decidability of the non-monotonic sentential calculus are proven. Also discussed are characteristic properties of this logic and its relationship to stronger logics, logics of incomplete information, and truth maintenance systems. GRA

N79-21833# Southern Methodist Univ., Dallas, Tex. Dept. of Computer Science.

ON THE THEORY OF UNIDIRECTIONAL ERROR CORRECTING/DETECTING CODES

Bella Bose and T. R. N. Rao Sep. 1978 36 p refs

(Contract N00014-77-C-0455; Grant NSF ENG-76-11237)

(AD-A063389; CS-7817) Avail: NTIS HC A03/MF A01 CSCL 09/4

Some basic theory on unidirectional error (i.e. all bits fail in the same direction) correction/detection are presented for binary block codes. Then a new class of codes are constructed which corrects single errors and detects any number of multiple unidirectional errors. Some codes are shown which hither-to-fore known to possess only symmetric error detection/correction properties which can be modified to make them suitable for unidirectional error correction/detection. GRA

N79-21834# Army Aviation Research and Development Command, St. Louis, Mo.

DETERMINATION OF THE FLOAT FACTOR BY QUEUEING THEORY Final Report

Frank Fox Sep. 1978 35 p refs

(AD-A063531; USAAVRADCOM-TR-78-60) Avail: NTIS HC A03/MF A01 CSCL 12/2

One of the important problems which is of recurrent concern within the Department of Army is the accurate determination of the operational readiness float factor for a fleet of aircraft. If the float is too small, there will be a loss of service of those aircraft needing float replacements when none are available. On the other hand, if the float is too large, there will be a financial burden of providing float aircraft which are not needed. The important question of the optimum size of the float can be answered by recognizing that the demand for and utilization of float aircraft can be interpreted as a queueing system which can be analyzed by classical queueing theory. The solution of the queueing model provides statistics which represent the average number of aircraft needing float replacement when none are available and the average number of float aircraft which are available but unneeded. By evaluating these statistics for the various possible float sizes, the decision maker can select the optimum size of the float. This methodology provides an excellent means of determining the ideal float size for a fleet of aircraft. It requires very little input data which should be easy to obtain, and it allows easy and complete sensitivity analysis.

Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N79-21835 Columbia Univ., New York.

A PROBLEM SEQUENCE DEVELOPMENT OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS FOR ADVANCED UNDERGRADUATES Ph.D. Thesis

Manuel Sotelo Alvarez 1978 325 p

Avail: Univ. Microfilms Order No. 7908573

Partial differential equations are used to relate different mathematical areas like advanced calculus, linear algebra and complex variables at undergraduate level by developing sequences of problems. The concept of direct and inverse problem for a linear partial differential operator, calculus and partial differential equations are related in the context of a linear mapping acting on a vector space of functions. The inverse problem with Cauchy data for first order linear operator in two and three independent variables is solved in four different contexts: Taylor's theorem, directional derivative, inversion function theorem and total differential. Diagonalization of matrices is used to relate linear algebra methods with partial differential equations. An elementary introduction to the space of tempered distributions in order to expose their use in solving initial value problems is presented. Dissert. Abstr.

N79-21836 South Carolina Univ., Columbia.

BROWNIAN MOTION ON BINARY TREES Ph.D. Thesis

Douglas Harold Frank 1978 70 p

Avail: Univ. Microfilms Order No. 7907603

The random motion that occurs in a binary tree structure due to diffusion is presented. The affect of a directional drift on the process was examined. Theorems with recursive absorption probabilities and a recursive result for expected absorption time are given. Some possible applications of the model as well as some modifications and extensions that could be made are discussed. Dissert. Abstr.

N79-21837 Oregon Univ., Eugene.

ON POLYNOMIAL MONOSPLINES WITH ODD MULTIPLICITY OF LEAST UNIFORM NORM AND RELATED TOPICS Ph.D. Thesis

Kwok yin Kwan 1978 63 p

Avail: Univ. Microfilms Order No. 7907475

A general existence proof and a uniqueness proof for the degree n when n is an even integer were provided. The proof

was developed in three steps. As the first step, the parameter set was enlarged so as to include the possibility of the knots being allowed to coalesce. In this setting, divided difference bases were used to show the existence of a polynomial monospline of least uniform norm. Since the limit polynomial monospline has to remain in the original parameter set, it must be shown that an optimal polynomial monospline cannot have coalescing knots. To prove this it was first shown, under the assumption n was even, that the multiplicities of the knots of an optimal polynomial monospline were less than or equal to n-3. Three theorems from classical linear approximation theory, (1) strong unicity theorem, (2) Freud's theorem and (3) theorem of de la Vallee Poussin, were proved for the family of nonlinear polynomial monosplines. Dissert. Abstr.

N79-21838# Brown Univ., Providence, R. I. Div. of Applied Mathematics.
APPROXIMATION OF SOLUTIONS TO DIFFERENTIAL EQUATIONS WITH RANDOM INPUTS BY DIFFUSION PROCESSES
Harold J. Kushner Nov. 1978 22 p refs
(Contract N00014-76-C-0279; Grant AF-AFOSR-3063-76; Grant NSF ENG-77-12946)
(AD-A063706) Avail: NTIS HC A02/MF A01 CSCL 12/1

The topic of convergence has seen much work, starting with the fundamental papers of Wong and Zakai, and followed by others, including Khazminskii, Papanicolaou and Kohler, etc. From a non-probabilistic point of view, it has been dealt with by McShane and Sussmann. In this paper, a rather general and efficient method of getting the correct limits is discussed. The idea exploits some general semigroup approximation results of Kurtz, and often not only gets better results than those obtained by preceding methods, but is also easier to use. GRA

N79-21839# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
A FUNCTIONAL EXPANSION APPROACH TO THE SOLUTION OF NONLINEAR FEEDBACK SYSTEMS
Ram-Nandan P. Singh Jan. 1978 40 p refs
(Grant NSF ENG-76-02860)
(PB-288862/6; ESL-P-796) Avail: NTIS HC A03/MF A01 CSCL 12A

A new structure for the solution of nonlinear analytic systems, and an application of Bellman's Fundamental Technique to obtain the sub-optimal-feedback control of a class of quasilinear systems with nonquadratic performance indices are presented. The application of the Fundamental Technique with a nonlinear auxiliary equation is shown to result in higher order approximating equations which are linear. The method was illustrated by three examples. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N79-21840 Wisconsin Univ. - Madison.
CONTIGUITY OF PROBABILITY MEASURES ASSOCIATED WITH CONTINUOUS TIME STOCHASTIC PROCESSES Ph.D. Thesis
Michael Georgiou Akritas 1978 154 p
Avail: Univ. Microfilms Order No. 7823045

The question of contiguity is resolved for many types of continuous time stochastic processes. Specifically, conditions are established for the contiguity of (1) stationary Markov processes of the jump type; (2) stationary semi-Markov processes; (3) a very general class of processes with stationary, independent increments that includes the compound Poisson (or jump) processes and limits of jump processes; (4) stationary diffustion processes and (5) Gaussian processes with known covariance. Examples of the last two classes include the Ornstein-Uhlenbeck process, the Wiener process and the Brownian bridge. By establishing contiguity in all these general classes of stochastic processes, almost all the asymptotically optimal properties of parametric statistical procedures are provided for statisticians. Dissert. Abstr.

N79-21841 State Univ. of New York at Stony Brook.
TECHNIQUES IN ISOTONIC REGRESSION Ph.D. Thesis
Roland Yee-Long Soong 1978 171 p
Avail: Univ. Microfilms Order No. 7908394

The least squares estimates are not robust in the sense that they are easily spoiled by the presence of outlying observations. In lieu of the arithmetic mean and M-estimator (which is the maximum likelihood estimator of the least favorable distribution corresponding to the contaminated normal model) is proposed. A computational algorithm is furnished, and some small sample behavior is noted. The M-estimation method is extended to the linear model, equipped with a computational algorithm. On the basis of these results, a data analytic scheme is proposed, utilizing a mixture of isotonic regression, linear regression, bounded leverage and data transformation techniques. The issue of multivariate ordering is discussed, and an operational choice is made. Related problems of the determiniation of the directions of monotonicity and variable subset selection are tackled using the sign-case diagram methodology. Finally, the estimation procedure and other issues are generalized from the univariate case to multiple regression. Dissert. Abstr.

N79-21842 Iowa State Univ. of Science and Technology, Ames.
ROBUST ESTIMATION OF A LOCATION PARAMETER IN THE PRESENCE OF OUTLIERS Ph.D. Thesis
Ven-Shion Shu 1978 190 p
Avail: Univ. Microfilms Order No. 7907282

Bias and mean square error for various location estimators were investigated. These outliers are assumed to have a distribution differing from that of the main sample by either a location shift or a scale change, the emphasis here being on the former asymmetric contamination model. Numerical results are limited to the Gaussian case with one or two outliers. In the one-outlier situation exact values are obtained for location estimators expressible as linear functions of order statistics. Monte Carlo methods are needed in all other cases. In the Monte Carlo method variance reduction techniques are utilized throughout. A specific technique is developed for the case of shift in location. Remarks and recommendations are made on the relative merits of the various estimators studied. Dissert. Abstr.

N79-21843 Missouri Univ. - Columbia.
SCATTER DIAGRAMS FOR DATA ANALYSIS USING A CHARACTERIZATION PROPERTY Ph.D. Thesis
Marion Joseph Stith 1978 141 p
Avail: Univ. Microfilms Order No. 7906931

The parent distribution as belonging to one of a class of distributions that is of interest to the investigator is classified. The classification is a characterization of the normal distribution. This characterization is based on the independence of the sample mean and variance. Graphical methods indicate that the relationship between these variables can distinguish between a wide variety of distributions. This is done through objective criteria for some cases, but subjective eye-judgement is suggested for others. The graphs are depicted in the two-dimensional space of statistics related to tests for linearity and quadratic behavior. They are shown to be quite powerful in identifying samples coming from normal, exponential, and Cauchy distributions. Since such techniques are influenced by sampling errors, justification of a more mathematical nature is required. Dissert. Abstr.

N79-21844 Ohio State Univ., Columbus.
DISTRIBUTION-FREE TESTS FOR THE BIVARIATE TWO-SAMPLE LOCATION PROBLEM Ph.D. Thesis
George William Sturm 1978 97 p
Avail: Univ. Microfilms Order No. 7908222

Two classes of statistics are introduced. One being a class of distribution-free count tests and the other a class of asymptotically distribution-free rank tests. The count tests were extensions of Chatterjee and Sen's bivariate median test. By letting the quadrant lines be functions of the correlation structure of the combined sample data points and by fixing the number of observations falling into each quadrant, the count tests were distribution-free with fairly stable empirical power curves. The rank test statistics were extensions of Hotelling's T squared statistic. Here a Mann-Whitney-Wilcoxon test was performed on the data points that were projected onto a ranking line that had been determined by a slope estimator S prime. It was found

that the statistics were asymptotically distribution-free when conjugate N(S prime-S) was bounded in probability but that the choice of an estimator greatly affected how quick this convergence was. In conclusion, two classes of test statistics were introduced for the bivariate two-sample location problem and were compared against some of the already existing tests. Dissert. Abstr.

N79-21845 Michigan Univ., Ann Arbor.
OPTIMAL AND ADAPTIVE STOPPING FOR A GENERALIZED EHRENFEST URN MODEL Ph.D. Thesis
Tony Chak-leung Tai 1978 96 p
Avail: Univ. Microfilms Order No. 7907180

Some adaptive strategies for a modified Ehrenfest urn model, in which the parameters are unknown were proposed and compared. The generalized Ehrenfest model was an urn that contains M>0 balls of which r were red and the rest were white. The composition of the urn was sequentially modified at discrete stages. At a given stage, if the number of red balls in the urn is r, then with probability p sub r a white ball was selected and replaced by a red, with probability q sub r a red ball was selected and replaced by a white, and with probability s sub r = 1-p sub r the ball selected was returned to the urn. These transition probabilities govern a semi-elastic model in the sense that p sub r and p sub r/q sub r are nonincreasing functions of r, with p sub M = q sub 0 = 0. Dissert. Abstr.

N79-21846 Texas Univ. Health Science Center, Houston.
A TWO COMPARTMENT REGRESSION MODEL AND SURVIVAL ANALYSIS WITH COVARIATES APPLIED TO FOLLOW-UP STUDY COMPLIANCE Ph.D. Thesis
Elliot OBrian Smith 1977 215 p
Avail: Univ. Microfilms Order No. 7909159

The methodology for survival analysis with concomitant information was developed and Markov models were used in an attempt to explain behavioral changes such as medical study participation and goal blood pressure achievement. Methods of survival analysis with concomitant information are applied to Hypertension Detection and Follow-up Program (HDFP) drop-out data and the methodology was designed for an approach which combines regression analysis with a Markov process. The Markov process regression model is applied to HDFP drop-out data, and both analytical and empirical comparisons between the various models are made. Dissert. Abstr.

N79-21847*# System Development Corp., Edwards, Calif.
BETA DISTRIBUTIONS: A COMPUTER PROGRAM FOR PROBABILITIES AND FRACTILE POINTS Final Report
James D. Brownlow and Ram Swaroop May 1979 19 p refs (Contract NAS4-2334)
(NASA-CR-144880) Avail: NTIS HC A02/MF A01 CSCL 12A

A beta distribution is specified by range parameters a < b, and two shape parameters alpha and beta > 0. The computer program presented calculates any desired probability and/or fractile point for specified values of a, b, alpha, and beta. This program additionally computes gamma function values for integer and noninteger arguments. Author

N79-21848# Brown Univ., Providence, R. I. Center for Dynamical Systems.
RATES OF CONVERGENCE FOR STOCHASTIC APPROXIMATION TYPE ALGORITHMS
Harold J. Kushner and Hai Huang Oct. 1978 20 p refs (Contract N00014-76-C-0279; Grants AF-AFOSR-3063-77; NSF ENG-77-12946)
(AD-A063707) Avail: NTIS HC A02/MF A01 CSCL 12/1

A general form of the stochastic approximation algorithm is considered. Such algorithms occur frequently in applications to adaptive control and identification problems. It is shown that the sequence of suitable continuous parameter interpolations of the sequence of 'tails' converges weakly to a Gaussian diffusion. The assumptions are quite reasonable from the point of view of applications. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N79-21849 California Univ., Los Angeles.
AN EXPLORATION OF APPROXIMATE SOLUTION STRATEGIES FOR COMBINATORIAL OPTIMIZATION PROBLEMS Ph.D. Thesis
Robin Segerblom Liggett 1978 207 p
Avail: Univ. Microfilms Order No. 7907669

A number of applications, dealing specifically with the class of problems known as quadratic assignment problems is discussed. Heuristic techniques are employed for the solution of these problems. An implicit enumeration algorithm developed by Graves and Whinston was developed, to generate an initial solution to a problem. This solution can be modified using a variety of heuristic improvement procedures. This coupling of a good constructive technique with an improvement procedure produces superior results, both for samll test problems in the literature and for large-scale problems which are presently computationally infeasible. A solution procedure capable of solving large-scale realistic problems was developed. Techniques for reducing both the computation and data storage requirements of the constructive and improvement algorithms are explored. Dissert. Abstr.

N79-21850 Pennsylvania State Univ., University Park.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE JOINT PHOTOCOUNT STATISTICS Ph.D. Thesis
James Anthony Quarato 1978 166 p
Avail: Univ. Microfilms Order No. 7909114

The superposition of the signal and thermal light incident on a photomultiplier tube was studied. The thermal light had a Lorentzian spectral shape. The techniques can be used for chaotic radiation having arbitrary bandwidths. There were two attempts to solve the joint photocount problem. In the first, no assumptions were made about the bandwidth of the chaotic radiation, while in the second only narrow band radiation was considered. In both, theoretical approaches started with the generating function in matrix form; the approach for arbitrary bandwidths was very complex and could only be generated for a few terms in the joint distribution for the chaotic radiation case. Both of these methods were programmed. Dissert. Abstr.

N79-21851 Syracuse Univ., N. Y.
PARAMETRIC IDENTIFICATION OF SYSTEMS VIA LINEAR OPERATORS Ph.D. Thesis
Joshua Nebat 1978 202 p
Avail: Univ. Microfilms Order No. 7908558

The identification procedure is shown to consist of two basic parts: (1) the generation of a set of basis functions through a linear operation upon the input and output signals of the system, and (2) the choice of an error criterion and its associated approximation scheme, which when used along with the basis set, generate the numerator and denominator parameters of the transfer function. It is demonstrated that some known parametric identification techniques derive from the general model as special cases associated with a particular linear operator. It is shown that certain operators are inherently ill-posed and generate a set of basis functions that is practically linearly dependent. The extensions of the technique to slowly time-varying systems and weakly nonlinear systems are discussed and demonstrated through examples. Poles belonging to successive approximations of increasing order form so-called growing tree patterns in the S-plane. The potential benefit of the growing tree in time domain synthesis and in system identification is pointed out. Dissert. Abstr.

N79-21852# Princeton Univ., N. J. Dept. of Statistics.
ASPECTS OF OPTIMAL DESIGN IN DYNAMIC SYSTEMS
D. M. Titterington Sep. 1978 35 p refs (Contract N00014-75-C-0453)
(AD-A062750; TR-141-SER-2) Avail: NTIS HC A03/MF A01 CSCL 12/2

This paper attempts to provide an introduction for statisticians to the version of optimal experimental design theory for parameter estimation in regression models that is appropriate to dynamic

systems. The paper consists of three main parts: first, a glossary of some erminology in control engineering and an introduction to the main aspects of dynamic systems; second, a summary of the principal results and patterns in optimal experimental design theory; and third, the ways in which the latter carry over to dynamic models. These application are split roughly into those in which sampling items are selected. Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N79-21853 Stanford Univ., Calif.
SELF-MAPS OF CLASSIFYING SPACES OF FINITE GROUPS AND CLASSIFICATIONS OF LOW-DIMENSIONAL POINCARE DUALITY SPACES Ph.D. Thesis
Celia Margot Witten 1978 91 p
Avail: Univ. Microfilms Order No. 7905950

The first part concerns the classifying spaces of finite groups. Given a finite group G, the classifying space of G is the space with fundamental group G and trivial higher homotopy groups. The cohomology of G is defined to be the cohomology of its classifying space. Attention was focused on the ring of stable self-maps of a classifying space for a finite p-group P. In particular, let P be the p-Sylow subgroup of a group G. Then stably, the classifying space for G, localized at p, is a wedge summand of the classifying space of P. In the second part, low dimensional Poincare duality spaces were classified with certain connectivity restrictions. In particular, every space was assumed to be simply-connected. Dissert. Abstr.

N79-21854 Oregon Univ., Eugene.
SUBGROUPS OF UNITARY AND ORTHOGONAL GROUPS GENERATED BY LONG ROOT GROUPS Ph.D. Thesis
Agnes Andreassian 1978 104 p
Avail: Univ. Microfilms Order No. 7907439

The problem considered in this thesis is to determine all irreducible subgroups G of unitary and orthogonal groups generated by long root groups. Such groups can be studied via the corresponding set of axes of the long root groups, in the case of an orthogonal group, and via the corresponding set of centers, in the case of a unitary group. The problem, for groups generated by two or three long root groups, can be dealt with directly by considering all possible ways in which the two or three axes, or centers, can be related to each other.
Dissert. Abstr.

N79-21855 State Univ. of New York at Stony Brook.
FREDHOLM AND INVERTIBLE TUPLES OF BOUNDED LINEAR OPERATORS Ph.D. Thesis
Raul Enrique Curto 1978 115 p
Avail: Univ. Microfilms Order No. 7908403

The sets considered were I(H), D(H) and N(H) of commuting invertible tuples, doubly commuting invertible tuples and normal invertible tuples, respectively, of bounded linear operators on a Hilbert space H, where invertible is to be understood as a joint spectrum for several commuting operators. The proof for the theorem and N(H) are arcwise connected, regardless of the dimension of H, and that the same is true for I(H) when H is finite dimensional is described. A number of techniques which generalize nicely those of the one variable situation is developed. In particular, Sp(T,H) = SP(T,L(H) carries over to n-tuples. A comprehensive account of all basic facts of this several variables theory was in complete harmony with the classical knowledge. An essentially normal n-tuple with all commutators in trace class has necessarily index zero and a natural generalization of Atkinson's theorem holds in F(H). Dissert. Abstr.

N79-21856 Clark Univ., Worcester, Mass.
CENTRALIZERS OF UNIPOTENT ELEMENTS IN SYMPLECTIC GROUPS Ph.D. Thesis
John Frederick Fegreus 1978 146 p
Avail: Univ. Microfilms Order No. 7906999

The problem of explicitly finding the centralizers of unipotent elements is addressed. A suitable set of representatives was found for the unipotent conjugacy classes of G such that if u is such a representative, then the generators of Z sub G(u) can be explicitly described by algorithms in terms of the Chevalley set of generators for G. Furthermore, the generators of the unipotent radical of Z sub G(u) lie in U and the generators of the Levi factor satisfy the Steinberg or Curtis relations modulo the unipotent radical for the required symplectic and orthogonal groups. It should also be noted that these algorithms are quite easily programable for use on a computer with the partition of 2l the only necessary input. Dissert. Abstr.

N79-21857 Brown Univ., Providence, R. I.
ISOMETRIC IMMERSIONS BETWEEN INDEFINITE FLAT SPACES WITH PARALLEL SECOND FUNDAMENTAL FORMS Ph.D. Thesis
Martin Andrew Imagid 1978 82 p
Avail: Univ. Microfilms Order No. 7906577

Isometric immersions R to the nth power yields R sub 1 to the n + k power, R sub 1 to the nth power yields R sub 1 to the n + 2 power, and R sub 1 to the nth power yields R sub 2 to the N + 2 power with parallel second fundamental form are classified, where R sub j to the mth power is the m-dimensional affine space R to the mth power with metric ds to the 2d power = -(dx) to the 2d power ... -(dx to the j power) to the 2d power + (dx to the j + 1 power) to the 2d power + ... + (dx to the mth power) to the 2d power. Dissert. Abstr.

N79-21858 Columbia Univ., New York.
NOTIONS OF POSITIVITY FOR COHERENT SHEAVES OVER COMPACT COMPLEX SPACES Ph.D. Thesis
Joshua Heshel Rabinowitz 1978 96 p
Avail: Univ. Microfilms Order No. 7908661

Several notions of positivity for coherent sheaves over compact complex spaces are introduced and examined. The principal results of this examination are a vanishing theorem for positive coherent sheaves and a generalization of Kodaira's embedding theorem to a characterization theorem for Moisezon spaces.
Dissert. Abstr.

N79-21859 Florida Univ., Gainesville.
ESTIMATION AND PREDICTION FOR CERTAIN MODELS OF SPATIAL TIME SERIES Ph.D. Thesis
Lloyd Marlin Eby 1978 143 p
Avail: Univ. Microfilms Order No. 7907737

The primary objective is to consider a special class of first-order autoregressive multivariate time series models in which the individual series correspond to locations on a plane. An estimation procedure is proposed which takes into account the spatial nature of the process through modification of the usual Yule-Walker estimators. Using the results for the usual Yule-Walker estimators, the procedure is shown to be consistent and asymptotically normally distributed for both the known and variable weights cases. A benefit of this approach to the spatial time series problem is that straightforward asymptotic tests for location, neighbor, and distance effects can be obtained. Asymptotic joint confidence ellipsoids are also given for these parameters. Consistent estimators of the variance-covariance matrices of the error term and the time series are presented. Some simulation results are presented which indicate that the performance of these estimators depends on the location, neighbor, and distance effects as well as array characteristics. Dissert. Abstr.

N79-21860 Ohio State Univ., Columbus.
AN INVESTIGATION OF BOOLEAN IMAGE NEIGHBORHOOD TRANSFORMATIONS Ph.D. Thesis
Peter Edwin Miller 1978 132 p
Avail: Univ. Microfilms Order No. 7908182

An algebraic structure is developed for a class of neighborhood image transformations on discrete point images whose elements belong to a Boolean algebra. Two Boolean neighborhood transformations are defined in terms of discrete image convolutions and several lemmas and theorems are proven for these operations. It is shown that these definitions and theorems induce integer-like characteristics on discrete point, Boolean-valued images. Subsequently, a Boolean image division algorithm is developed similar to that for integers. This division algorithm is then used to develop a power series expansion for Boolean-valued images in terms of an arbitrary basis image, which is similar to the common radix representation of integers. The problems of finite

image size and non-Boolean image values are then considered for picture processing applications. Finally, a binary image processor model and its simulation on a Digital Equipment Corporation PDP-9 minocomputer is described. Dissert. Abstr.

N79-21060# Rolls-Royce Ltd., Derby (England).
A STALL CRITERION FOR CASCADES
R. M. Raley *In* Von Karman Inst. for Fluid Dyn. Proc. of the Seminar on Adv. Probl. in Turbomachinery, Pt. 1 Oct. 1965 18 p (For primary document see N79-21053 12-07)
Avail: NTIS HC A09/MF A01

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N79-21861 Florida Univ., Gainesville.
QUANTUM KINETIC THEORY OF TIME CORRELATION FUNCTIONS Ph.D. Thesis
David Bryan Boercker 1978 230 p
Avail: Univ. Microfilms Order No. 7907725

The exact linear kinetic theory for time correlation functions is developed using modern classical theories as a guide. The utility of the formalism is demonstrated through two examples. When applied to a low-density degenerate gas the resulting kinetic equation reduces to a linearized version of the Uehling-Uhlenbeck equation. Also, a kinetic equation appropriate for a system interacting through long range forces is discussed by considering the self-diffusion of an impurity in a plasma and the broadening of spectral emission lines by a plasma. The results obtained apply for degenerate as well as classical plasmas. Dissert. Abstr.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N79-21862 American Univ., Washington, D. C.
BRILLOUIN SCATTERING IN INORGANIC GLASSES Ph.D. Thesis
Donald Keith Day 1978 144 p
Avail: Univ. Microfilms Order No. 7907833

The longitudinal and shear ultrasonic absorption coefficients were measured for B2O3 glass, and for Vycor, as a function of temperature from 300 K to the melting point of the glass. The coefficients were measured by 90 Brillouin scattering techniques utilizing an argon ion laser, precision temperature controlled furnace, Fabry-Perot spectrometer, multichannel scaler, and an on-line PDP11/40 computer. The experimental spectra were analyzed and fitted with the aid of an interactive graphics program written in FORTRAN. The B2O3 results eliminate thermally driven density fluctuations and the phase separated glass results eliminate built-in density fluctuations as important mechanisms for ultrasonic absorption at high temperatures and Brillouin frequencies. The Vycor measurements are correlated with previously measured silica and crystal quartz absorption data and a dual-absorption model is proposed for the ultrasonic absorption mechanisms operating in a tetrahedrally coorinated glass such as Vycor or silica. Dissert. Abstr.

N79-21863 Georgia Inst. of Tech., Atlanta.
TURBULENCE MEASUREMENTS USING PULSED DOPPLER ULTRASOUND Ph.D. Thesis
Vijay Saxena 1978 171 p
Avail: Univ. Microfilms Order No. 7907432

A demodulating scheme is proposed by relating the statistical probability density functions of velocities inside the region of Doppler sensitivity (i.e., sample volume) to the Doppler shifted signal originating from this region. The first moment of the normalized power spectrum of the Doppler signal received from a sample volume is hypothesized to be the spatially-averaged velocity within it. This demodulator is realized through the use of digital methods and therefore is called the Digital First Moment (DFM) method. Through the use of this DFM method the spatially-averaged velocity can be sampled to obtain the time history from which relevant information about the turbulent flow may be derived. The validity of the proposed model is tested. Dissert. Abstr.

N79-21864 Iowa State Univ. of Science and Technology, Ames.
MATHEMATICAL MODELING OF PULSED-ULTRASOUND SYSTEMS Ph.D. Thesis
Thomas Wayne Buckman 1978 120 p
Avail: Univ. Microfilms Order No. 7907239

A method is developed to mathematically model the operation of a pulsed-ultrasound system operating in the A-scan mode. This method includes the development of a new approach for solving the inherent pulse reflection problem associated with such a model. The approach used in solving the pulse reflection problem is based on the theory of physical optics. It results in the deprivation of an integral expression which can be used to predict the reflection of exponentially damped sinusoidal pulses off irregularly shaped objects. In addition, an approximate method of solving the integral expression is also developed and forms the heart of the pulsed-ultrasound system mode. Dissert. Abstr.

N79-21865 Wayne State Univ., Detroit, Mich.
CRITICAL FLUCTUATIONS IN A SPIN GLASS: AN ULTRASONIC STUDY OF CuMn Ph.D. Thesis
Gary Frederick Hawkins 1978 55 p
Avail: Univ. Microfilms Order No. 7908917

The critical exponent alpha' for a spin glass was determined. Sound velocity measurements were made on a CuMn single crystal which exhibited the characteristic spin glass cusp in the low-field, ac susceptibility. A sound velocity anomaly oberved in the vicinity of the susceptibility peak temperature was attributed to critical fluctuations. A thermodynamic argument is presented which relates the critical part of the specific heat to that of the second velocity. By using the form delta C sub v = P - Q' t to the - alpha' power for the critical part of the specific heat, the velocity data was fit with alpha' as the only adjustable parameter. The data are well described by this power law for values of t as large as 0.8. This fact is unusual but consistent with current theories which suggest that critical fluctuation phenomena are very large at all temperatures below the spin glass temperature. Alpha' = - 1.9 plus or minus 0.2. Dissert. Abstr.

N79-21866 Northwestern Univ., Evanston, Ill.
BULK ACOUSTIC WAVE DEVICES UTILIZING ZnO THIN-FILM INTERDIGITAL TRANSDUCERS Ph.D. Thesis
Yung-Chau Yen 1978 87 p
Avail: Univ. Microfilms Order No. 7907956

Since the first report on the efficient excitation of bulk acoustic waves with interdigital transducers, bulk acoustic waves have attracted more attention in device applications. An oscillator employing bulk acoustic waves was recently described giving rise to a new family of bulk acoustic wave device. Higher frequency operation of interdigital transducers for the efficient generation of bulk acoustic waves is shown, and the feasibility of the multichannel response employing bulk acoustic waves is demonstrated. Potential applications in the channelized receiving and multiplexing in communication system are explored. Advantages and disadvantages of both bulk and surface acoustic waves are also discussed. Dissert. Abstr.

N79-21867*# National Aeronautics and Space Administration, Washington, D. C.
DETERMINATION OF TRAFFIC NOISE NUISANCE AS A FUNCTION OF TRAFFIC TYPE AND DENSITY IN A HEAVILY POPULATED AREA
G. Heimerl and E. Holzmann Apr. 1979 10 p Transl. into ENGLISH from West German report no. 13, Aug. 1978 7 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Stuttgart Univ., West Germany
(Contract NASw-3199)
(NASA-TM-75414) Avail: NTIS HC A02/MF A01 CSCL 20A

On the basis of a study including noise level measurements during the day and night and 1125 interviews with residents, it was found that railway noise creates less of a disturbance than

street traffic noise. By far the largest majority of respondents experienced the greatest disturbance during the day. The difference in nuisance decreases as noise level rises. Author

N79-21868*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRELIMINARY NOISE TRADEOFF STUDY OF A MACH 2.7 CRUISE AIRCRAFT
V. R. Mascitti, D. J. Maglieri, ed., and J. P. Raney, ed. Apr. 1979 50 p refs
(NASA-TM-78732) Avail: NTIS HC A03/MF A01 CSCL 20A

NASA computer codes in the areas of preliminary sizing and enroute performance, takeoff and landing performance, aircraft noise prediction, and eocnomics were used in a preliminary noise tradeoff study for a Mach 2.7 design supersonic cruise concept. Aerodynamic configuration data were based on wind-tunnel model tests and related analyses. Aircraft structural characteristics and weight were based on advanced structural design methodologies, assuming conventional titanium technology. The most advanced noise prediction techniques available were used, and aircraft operating costs were estimated using accepted industry methods. The 4-engines cycles included in the study were based on assumed 1985 technology levels. Propulsion data was provided by aircraft manufacturers. Additional empirical data is needed to define both noise reduction features and other operating characteristics of all engine cycles under study. Data on VCE design parameters, coannular nozzle inverted flow noise reduction and advanced mechanical suppressors are urgently needed to reduce the present uncertainties in studies of this type. A.R.H.

N79-21869*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE AND PERFORMANCE CALIBRATION STUDY OF A MACH 2.2 SUPERSONIC CRUISE AIRCRAFT
V. R. Mascitti and D. J. Maglieri Jan. 1979 26 p ref
(NASA-TM-80043) Avail: NTIS HC A03/MF A01 CSCL 20A

The baseline configuration of a Mach 2.2 supersonic cruise concept employing a 1980 - 1985 technology level, dry turbojet, mechanically suppressed engine, was calibrated to identify differences in noise levels and performance as determined by the methodology and ground rules used. In addition, economic and noise information is provided consistent with a previous study based on an advanced technology Mach 2.7 configuration, reported separately. Results indicate that the difference between NASA and manufacturer performance methodology is small. Resizing the aircraft to NASA groundrules results in negligible changes in takeoff noise levels (less than 1 EPNdB) but approach noise is reduced by 5.3 EPNdB as a result of increasing approach speed. For the power setting chosen, engine oversizing resulted in no reduction in traded noise. In terms of summated noise level, a 6 EPNdB reduction is realized for a 5% increase in total operating costs. A.R.H.

N79-21870# Tennessee Univ., Knoxville. Ultrasonics Lab.
STUDIES OF LINEAR AND NONLINEAR ULTRASONIC PHENOMENA Interim Report
M. A. Breazeale Nov. 1978 83 p refs
(Contract N00014-76-C-0177)
(AD-A063658; TR-17) Avail: NTIS HC A05/MF A01 CSCL 20/1

The technical report is divided into three parts: Part 1. Ultrasonic wave velocity and attenuation are measured in the critical mixing region of the binary liquid mixture hexane and beta, beta:-dichloroethyl ether. The results are compared with results in other binary liquid mixtures. Part 2. Comparison of the measurement of ultrasonic pressure amplitudes by four different techniques and measurement of ultrasonic wave velocity in solids by use of capacitive transducers. Part 3. Nonlinear acoustics of solids is discussed. Nonlinearity parameters of germanium, fused silica, and copper are measured, and their temperature dependence is determined between 3 K and 300 K. Author (GRA)

N79-21871# Catholic Univ. of America, Washington, D. C. Dept. of Physics.
A FORTRAN CODE FOR THE CALCULATION OF SOUND PROPAGATION IN A RANGE DEPENDENT OCEAN. VOLUME 1: THE DEPTH FUNCTIONS Final Report, 15 Oct. 1976 - 15 Jan. 1977
Anton Nagl, G. L. Zarur, and H. Ueberall Jun. 1978 109 p ref
(Contract N00173-77-C-0008; SF525691)
(AD-A062915) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report describes a computer code which solves the wave equation for sound propagation in the ocean with arbitrary depth dependence and arbitrary but gradual range dependence of the sound velocity distribution. The present volume (vol. 1) is concerned with the depth functions which arise from the expansion of the velocity potential into a normal mode sum that leads to a near-separation of the range and depth dependent parts of the problem. The resulting depth functions satisfy locally a one-dimensional wave equation which together with the imposed boundary conditions defines an eigenvalue problem. The computer code described here permits to solve this problem for a wide variety of conditions. Deep ocean profiles can be treated for frequencies up to a few hundred Hz. For shallow water cases the frequency range easily extends to several kHz. A further volume of this report will deal with the range functions and with the solution of the mode coupling problem. Author (GRA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N79-21872 Johns Hopkins Univ., Baltimore, Md.
SOME PROBLEMS IN TIME-DEPENDENT AND NON-LINEAR PARTICLE TRANSPORT THEORY Ph.D. Thesis
James Robert Swandic 1979 362 p
Avail: Univ. Microfilms Order No. 7906498

Monochromatic scattering in one dimensional rod geometry is considered. Basic concepts of particle transport theory are reviewed, transport equations are derived, and physical assumptions usually made are discussed. Analytic methods developed are described for both steady state and nonstationary cases of time dependent particle transport. The interaction of two photons while both are in the process of being scattered is examined as well as the case in which the absorption of a particle changes the scattering properties of a scatterer. Solutions are found for special cases such as pure absorption, the quasi-static approximation, and an optically thin medium. Dissert. Abstr.

N79-21873 Brown Univ., Providence, R. I.
CONTROL OF THE MOTION OF NEUTRAL MOLECULES AND ATOMS BY A BEAM OF ELECTRONS Ph.D. Thesis
Hector Demetrios Lambropoulos 1978 136 p
Avail: Univ. Microfilms Order No. 7906573

Neutral molecules and atoms either from a thermal source or from the residual gas of the vacuum were observed to concentrate near the axis of magnetically confined beams of electrons typically at an energy of 300eV. Tests were carried out to ensure that the increase of signals of the detectors could be attributed only to neutral molecules and atoms that were attracted to the axis of the electronic beams. Two models for the forces of the electronic beams on the neutrals were proposed. Forces due to the cylindrically symmetric and radially inhomogeneous electric field of the space charge of the electronic beams could account for only .01 - .1 of the increase of the flux of neutrals to the surface ionization detector. Deflections of neutrals towards the axis of symmetry of the distribution of the electronic space charge due to series of individual electron-molecule collisions could account for .1 - .01 of the increase of the flux of the neutrals to the surface ionization detector.
Dissert. Abstr.

N79-21874 Pennsylvania Univ., Philadelphia.
CALCULATIONS OF ELECTRIC AND MAGNETIC SUSCEPTIBILITIES. 1: ELECTRIC SUSCEPTIBILITIES OF SMALL MOLECULES. 2: DIAMAGNETIC SUSCEPTIBILITY OF THE HYDROGEN MOLECULE Ph.D. Thesis
Hae-Won Kim 1978 130 p
Avail: Univ. Microfilms Order No. 7908759

The molecular electric polarizability of the hydrogen molecular

ion, the hydrogen molecule and the boron hydride molecule was calculated by means of variation-perturbation method. The results are compared to the best known theoretical results and the agreements are within 1% for the H2+ ion and within 2.5% for the H2 molecule. The error analysis involved in calculating the second-order energy perturbation is also discussed. The rational magnetic moment and the diamagnetic susceptibility of the hydrogen molecule were also calculated. The second-order energy perturbation, which is related to the rotational magnetic moment and the diamagnetic susceptibility come out to be within 10% of experimental error. Dissert. Abstr.

N79-21875 Northwestern Univ., Evanston, Ill.
INTRAMOLECULAR ELECTRON TRANSFER THEORY: A STUDY OF PURELY ELECTRONIC EFFECTS Ph.D. Thesis
Mary Jo Ondrechen 1978 195 p
Avail: Univ. Microfilms Order No. 7907920

Site-to-site electron and hole migration is studied in two- and three-site Hubbard systems, employing the propagator method. Time-dependent transfer probabilities are calculated. The effects of orbital coupling and single-site transfer probability are discussed. The effect of basis function overlap on the site-to-site transfer probability in a two-site Hubbard system is studied. The relationship between the rate constant obtained from a correlation function method and a time-dependent transfer probability expression is discussed. A time-dependent number operator is derived from the correlation function expression. The vibronic nature of intramolecular electron transfer is also discussed. Preliminary numerical results for ruthenium systems are reported. Dissert. Abstr.

N79-21876 Florida Univ., Gainesville.
SPATIAL AND ENERGETIC ASPECTS OF ELECTRON ENERGY DEPOSITION Ph.D. Thesis
Charles Herbert Jackman 1978 235 p
Avail: Univ. Microfilms Order No. 7907753

The spatial and energetic aspects of the electron energy degradation into molecular nitrogen gas were studied by a Monte Carlo method. Perpendicularly monoenergetic incident electrons with energies from 0.1 through 5.0 KeV were injected into the N2 gas. This Monte Carlo degradation scheme employed previously developed N2 cross sections with new phenomenological differential elastic and doubly differential ionization cross sections. All these agree quite well with experimental work and are consistent with the higher energy theoretical total cross section fall-off with energy. Dissert. Abstr.

N79-21877 Stanford Univ., Calif.
CURRENT ALGEBRA AND PCAC TREATMENT OF NON-LEPTONIC CHARM DECAYS Ph.D. Thesis
Sinan Kaptanoglu 1978 104 p
Avail: Univ. Microfilms Order No. 7905885

Various charmed meson decay matrix elements are computed and related to each other. With assumption that the decay Hamiltonian has the delta I = 1 form, numerous decay rates are interrelated. The predictions are compared to the experiment. To obtain a value for the D yielding K pion pion decay amplitudes the Current Algebra techniques and PCAC, are used and the enhancement of these amplitudes are attributed to the final state interactions. An approximate treatment of the problem is suggested, and it is shown that, it is possible to obtain the desired enhancement. The free parameters in the theory are fitted to the already existing data, and the relative rates of some yet unobserved decays are predicted. Dissert. Abstr.

N79-21878 Michigan Univ., Ann Arbor.
MEASUREMENT OF PHI MESON PRODUCTION IN PROTON-NUCLEUS COLLISIONS AT 400 GeV/c Ph.D. Thesis
David Stanley Koltick 1978 125 p
Avail: Univ. Microfilms Order No. 7907111

An accurate measurement of the phi meson mass and width was made and analysis of the systematic error in the measurements was carried out. Phi meson production may be dominated by different mechanisms at low and high phi meson yields muon (+) muon (-) perpendicular. Using the measured phi meson/pion(-) ratio and the known branching ratio, the phi meson's contribution to the prompt muon/pion ratio was found as a function transverse momentum. The phi meson's contribution was found to be almost 2 orders of magnitude below the total muon/pion ratio. A test of the Okubo-Zweig-Iizuka (O-Z-I) rule was made by searching for an enhancement of K mesons produced in association with the phi meson. No enhancement was found, indicating a possible violation of the O-Z-I rule. This lack of enhancement could not be explained away by phi meson production through nonstrange quarks in its wave function. Dissert. Abstr.

N79-21879 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COLLISION INDUCED DISSOCIATION OF DIATOMIC MOLECULES Ph.D. Thesis
William Francis Bailey 1978 280 p
Avail: Univ. Microfilms Order No. 7908880

Using an experimentally consistent set of rates, the kinetic equations for molecular dissociation in a pure diatomic gas and diatomic gases in the presence of an inert diluent were formulated and solved. This solution established that in the temperature range typical to the dissociation process, a pseudo-steady state was rapidly attained. The time delay prior to the establishment of steady-state dissociation was calculated and exhibited good agreement with experimental measurements. An analytic steady state form for the vibrational population and dissociation rate was developed which agreed with the time-dependent calculations. The influence of rotational effects was considered. It was determined that rotational states play a significant role in the dissociation process and that the standard ladder model is inadequate. When rotational effects are properly included in the analysis, good agreement with experimental data is obtained. Dissert. Abstr.

N79-21880 Texas A&M Univ., College Station.
STUDIES IN NUCLEAR AND ATOMIC ACTIVATION ANALYSIS Ph.D. Thesis
Gerald John Stock, Jr. 1978 145 p
Avail: Univ. Microfilms Order No. 7909240

Characteristic K, I, and M X-ray and background radiation production yields for high energy heavy ion bombardment on a wide range of targets were measured. The feasibility of combined nuclear and atomic activation analysis was tested in two selected areas of application: the analysis of high purity metals for traces of hydrogen and higher Z impurities, and the stoichiometric characterization of metals containing biological compounds. An 8 MeV He-3 beam was used to determine O and C the content of alkaline phosphatase, amylase, carbonic anhydrase, diamine oxidase, myoglobin, and vitamin B12. Dissert. Abstr.

N79-21881 Brown Univ., Providence, R. I.
BORON-11 NUCLEAR MAGNETIC RESONANCE STUDIES OF BORATE GLASSES Ph.D. Thesis
Yong-Hoon Yun 1977 106 p
Avail: Univ. Microfilms Order No. 7906633

Nuclear Magnetic Resonance techniques were employed to investigate the environments of boron atoms as a function of composition in the following series of glasses; Na2O3-B2O3-SiO2, K2O-B2O3-P2O5 and Li2O-B2O3. It is found that the spectrum consists of the superposition of a narrow line which is due to boron atoms which are tetrahedrally bonded to four oxygens (BO4, units) and a broad line which is produced by a second-order quadrupole interaction in planar BO3 units. Dissert. Abstr.

N79-21882*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ABSOLUTE MEASUREMENTS OF THE ELECTRONIC TRANSITION MOMENTS OF SEVEN BAND SYSTEMS OF THE C2 MOLECULE Ph.D. Thesis - York Univ., Toronto
David M. Cooper Apr. 1979 172 p refs
(NASA-TM-78574; A-7791) Avail: NTIS HC A08/MF A01 CSCL 20H

Electronic transition moments of seven C2 singlet and triplet band systems in the 0.2-1.2 micron spectral region were measured. The measurements were made in emission behind incident shock waves in C2H2-argon mixtures. Narrow bandpass radiometers were used to obtain absolute measurements of shock-excited C2 radiation from which absolute electronic transition moments are derived by a synthetic spectrum analysis. New results are reported for the Ballik-Ramsay, Phillips, Swan,

Deslandres-d'Azambuja, Fox-Herzberg, Mulliken, and Freymark systems. Author

N79-21883# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistics Research Lab.
SINGLE-ELECTRON AND EXCITATION ENERGIES BY THE NON-MUFFIN-TIN X-ALPHA METHOD
D. A. Ringers and J. B. Danese Oct. 1978 21 p refs
(AD-A063524; AD-430147; ARBRL-TR-02109) Avail: NTIS HC A02/MF A01 CSCL 07/4

The X-alpha non-muffin-tin (NMT) corrections are developed for single-electron orbital energies (eigenvalues). Using the Slater transition-state concept and the NMT single-electron eigenvalue corrections, several excitation energies are calculated and found to agree with experimentally obtained values. The linear contribution to the single-electron energy is examined and found to be generally adequate to compensate for the larger part of the error inherent in the use of the muffin-tin approximation. The method gives improved accuracy over usual muffin-tin (MT) calculations while taking less time than comparable total energy calculations. Author (GRA)

N79-21884# Universal Energy Systems, Inc., Dayton, Ohio.
EXPERIMENTAL MEASUREMENTS OF CUMULATIVE EXCITATION AND IONIZATION IN ATOMIC AND MOLECULAR GASES Final Report, 9 Dec. 1974 - 16 May 1977
Max L. Lake Dec. 1977 125 p refs
(Contract F33615-75-C-1082)
(AD-A063306; AFAPL-TR-77-84) Avail: NTIS HC A06/MF A01 CSCL 20/10

This work described an experimental effort to determine the electron collision excitation and ionization cross sections of metastable atoms and molecules. The ionization cross section measurements were not successful. Excitation cross section studies were productive, and a number of direct and two-step cross sections were obtained. Measurements of several direct excitation cross sections of xenon in the range from 6000 A to 9000 A were made. These relative excitation functions compare favorably to data in the literature where it exists, and offer some insight to the lasing processes of the 5d levels. Measurements on the cross sections from the helium 2(3)S state to the 3(3)S, 3(3)P, 3(3)D, 4(3)S, and 4(3)D states were obtained. Results indicate that the 3(3)D level has the largest cross section. Evidence for the existence of the two-step cross section in Krypton has also been observed, but there is insufficient direct cross section data available to estimate the magnitude of the two-step process. An experimental investigation was performed to determine the cross sections of the relevant transitions. Excitation functions of several 5p, 6p, 7s and 5d states of Krypton have been measured. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N79-21885 Notre Dame Univ., Ind.
PARTICLE CORRELATIONS IN HIGH ENERGY PION-p INTERACTIONS Ph.D. Thesis
Raymond Leonard Bolduc 1979 185 p
Avail: Univ. Microfilms Order No. 7908376

Correlations between secondary particles in high energy pion(-) interactions at 360, 200, 100 and 18.5 GeV/c are investigated. The dependence of rapidity spectra for pion(+) and pion(-) secondaries on multiplicity and energy is discussed. Inclusive and semi-inclusive two particle rapidity correlation functions for unlike (-+) and like (--) pion pairs are presented. In both cases, short range positive rapidity correlations are observed in the central region. The dependence of the rapidity correlations on the difference in rapidity between two particles is examined. Like- and unlike-charge pair correlations are found to be different in nature. The correlations are examined in the context of a specific model for independent emission of clusters.
Dissert. Abstr.

N79-21886 California Univ., Irvine.
SCALE BREAKING IN DEEP INELASTIC LEPTON-NUCLEON SCATTERING Ph.D. Thesis
Dara Faroughy 1979 197 p
Avail: Univ. Microfilms Order No. 7908654

Various aspects of scale breaking phenomena in deep-inelastic lepton-nucleon scattering are presented. Results include: the old high-y anomaly (HPWF data) in neutrino (antineutrino)N inelastic scattering along with a large number of inelastic electron (muon)-nucleon data and new data (no anomalies) on average v's and the cross section ratio. In addition, many phenomenological fits to electroproduction structure junctions (SLAC-MIT data) are presented. A substantial number of scalars in the wee region of the scaling variable are shown. Some of these fits are used for the purpose of deriving quark (antiquark) distribution functions.
Dissert. Abstr.

N79-21887 Brown Univ., Providence, R. I.
HADRON-DEUTERON SCATTERING AT 50 GeV Ph.D. Thesis
Lorne Joel Levinson 1978 154 p
Avail: Univ. Microfilms Order No. 7906575

The forward scattering of positive pions, negative pions, and protons on deuterons and protons was measured with a single arm spectrometer. The invariant 4-momentum transfer range was .06 for less than t less than .32 sq(GeV/c) and p, and .06 for the positive pions. The missing mass, determined by the spectrometer, selected proton elastic and deuteron elastic-plus-breakup scattering, rejecting particle and resonance production events. The measured proton and deuteron differential cross-sections were analysed in the context of the Glauber Theory of deuteron elastic-plus-breakup scattering and a neutron elastic differential cross-section was extracted. The proton-neutron elastic differential cross-section was then extracted from the pd and pp data. The theory and the data were not found to be consistent within the random errors. An attempt to use recoil particle detectors to extract the deuteron elastic and the neutron cross sections is reported. Dissert. Abstr.

N79-21888 Michigan Univ., Ann Arbor.
ANTINEUTRINO NEUTRAL CURRENT INTERACTIONS IN A NEON AND HYDROGEN BUBBLE CHAMBER Ph.D. Thesis
William Charles Louis, III 1978 119 p
Avail: Univ. Microfilms Order No. 7907127

The short interaction length of hadrons in the Fermilab 15 ft bubble chamber was used to establish c various neutral current samples. The ratio of neutral to charged current production with hadronic energy at approximately more than 13.4 Gev, R' was then measured to be .37 plus or minus .07. The fraction of pions that are positive at high z was estimated to be .57 plus or minus. 11. The ratio of the antineutrino-neutron to antineutrino-proton neutral current production was estimated to be .53 plus or minus .39 which is lower than the prediction of the Weinberg-Salem model. Neutral V production by neutral and charged currents was compared. The ratio of the rate of neutral current neutral production to the rate of charged current Neutral V production was measured to be 1.08 plus or minus .35. This suggests that neutral current interactions of strange quarks occur, and that quarks prefer to fragment into Neutral K's.
Dissert. Abstr.

N79-21889 Ohio State Univ., Columbus.
RADIATIVE PROTON CAPTURE AT 35-100 MeV Ph.D. Thesis
Michael Andrew Kovash 1978 160 p
Avail: Univ. Microfilms Order No. 7908164

Gamma ray spectra resulting from proton bombardment of T, B-11, C-12, Al-27, Ti, and Y-89 were investigated at proton energies from 35 to 100 MeV. The measurements were made with a specially designed, large NaI (Tl) crystal spectrometer surrounded by an annulus of plastic scintillator used to reject cosmic ray events. Extensive pulse pile-up rejection circuitry is used, along with fast-gated and charge-sensitive analog-to-digital converters, coupled directly to the photomultiplier tubes of the

NAI and plastic detectors. Three systems of gain stabilization are employed. These major elements used in this investigation are described in detail. The results of a measurement of the angular distribution of analyzing powers for the reaction T(vector p, gamma)He-4 are given for proton energies of 2, 3, 4 and 5 MeV. A simplified solution of the equations connecting the observed angular distribution coefficients with the complex transition matrix elements is obtained. Dissert. Abstr.

N79-21890 Oregon Univ., Eugene.
QUASIELASTIC PION SCATTERING NEAR THE (3,3) RESONANCE Ph.D. Thesis
Philip Varghese 1978 197 p
Avail: Univ. Microfilms Order No. 7907510

The quasielastic pion scattering process (pi, pi p), in which an energetic pion scatters off a target necleus, knocking-out a bound proton, was studied to determine the role of recoil nucleon charge exchange in the mechanism of the process near the (3,3) free particle pion-nucleon resonances. Calculations were performed to predict expectations for observing the process. Experimental measurements were made on Al-27 and Pb-208, using 255-MeV pi(+) and pi(-) beams. The outgoing protons were observed in a counter telescope in singles and coincidence modes. Singles spectra were measured at proton angles theta p = 45, 55, 64 and 90 degrees and cross sections were calculated. The study established the inadequacy of observing quasielastic pion scattering in a single arm measurement.
Dissert. Abstr.

N79-21891 Pennsylvania Univ., Philadelphia.
MATRIX MECHANICS APPLICATIONS TO VIBRATIONAL AND ROTATIONAL COLLECTIVE MOTION IN NUCLEI Ph.D. Thesis
Moyez Gulamhussein Vassanji 1978 231 p
Avail: Univ. Microfilms Order No. 7908802

The anharmonic vibrations in two simplified solvable nuclear models, possessing the symmetries R(5) and R(5) x R(5) respectively are studied. The matrix elements and energies of the one- and two-phonon states are calculated using matrix mechanics, and compared with the results of an exact diagonalization. The asymmetric rigid rotor at a high angular momentum 1 is also studied. The generalized Hartree-Fock theory is used to derive from first principles the conditions under which a many-body system of nucleons behaves like an asymmetric rotor at large angular momentum. The case of a two-dimensional system of nucleons rotating in a plane is considered. The leading-order description of this system is also given by a self-consistent cranking model. Dissert. Abstr.

N79-21892 Michigan Univ., Ann Arbor.
FINITE ELEMENT SOLUTION OF THE TWO-DIMENSIONAL NEUTRON TRANSPORT EQUATION Ph.D. Thesis
Carl Eugene Yehnert 1978 233 p
Avail: Univ. Microfilms Order No. 7907203

A computer code, FTRAN2, was developed based on the Galerkin or weighted residual techniques, which is applied to the integral law formulation of the transport equation. Numerical studies verified the accuracy of the code with decreasing mesh spacing, which was then used to examine the ray effect. The ray effect refers to persistent anomalous bumps in the scalar flux which are commonly noted in discrete ordinates solutions to the transport equation. Although numerical results indicate the Galerkin finite element method eliminates the raw effect, execution time and core storage studies reveal the method is not competitive with discrete ordinates codes, or with finite element applications to the second-order transport equation, which also eliminates the ray effect. Dissert. Abstr.

N79-21893 State Univ. of New York at Stony Brook.
DEEP INELASTIC COLLISIONS IN LIGHT HEAVY-ION SYSTEMS Ph.D. Thesis
John William Harris 1978 260 p
Avail: Univ. Microfilms Order No. 7908640

The reaction mechanisms for scattering in light heavy-ion systems at incident energies well above the Coulomb barrier are examined. Angular distribution and energy-angle correlations of projectile-like reaction products from the O-16 + Al-27 and O-16 + Ni-58 systems were measured at E sub lab (O-16) = 60, 70, 80, 90, 100, 107 and 115 MeV using charged particle identification. The mass and charge of reaction products were measured simultaneously to test the applicability of a simple statistical interpretation of the isotope distribution in deep inelastic collisions. Multiparticle coincidence measurements were performed in which the Al-27(O-16, C-12 alpha) reaction at E sub lab = 65.6 MeV and the Al-27(O-16, HI-LI) reactions (HI = C, N, O or F and LI = proton or alpha-particle) at E sub lab = 100 MeV. A three-body classical friction model was developed in an attempt to describe the pre-equilibrium alpha-particles observed in quasi-elastic and deep inelastic reactions. Dissert. Abstr.

74 OPTICS

Includes light phenomena.

N79-21894 Pennsylvania Univ., Philadelphia.
STUDY OF LIGHT SCATTERING FROM SIMPLE FLUIDS Ph.D. Thesis
Harold Gerard Munson 1978 155 p
Avail: Univ. Microfilms Order No. 7909106

A model for the rotation of linear molecules in the liquid state is examined and the orientational correlation functions from Raman and depolarized Rayleigh light scattering of cyclopentane, dimethylacetylene, and methyl fluoride are reported.
Dissert. Abstr.

N79-21895 Brown Univ., Providence, R. I.
SURFACE REFLECTANCE SPECTROSCOPY STUDIES OF CHEMISORPTION ON LOW INDEX PLANES OF TUNGSTEN Ph.D. Thesis
Mark Andrew Passler 1978 168 p
Avail: Univ. Microfilms Order No. 7906598

A spectrometer was designed and built to determine the small chemisorption induced changes in reflectance. The most suitable method for analyzing the data was by fitting to Lorentzian oscillators. The chemisorption of H, O, and CO on W(100) and W(111) was investigated. On W(111) the changes in reflectance induced by the chemisorption of the different gasses were very similar. The main effect is due to the mere presence of the adsorbate rather than its identity suggesting geometric relaxation or distortion of the surface upon chemisorption. On W(100) there is greater diversity in the spectra for the different gasses. In addition there is dramatic structure in the changes in reflectance as a function of the surface coverage. Implications of the spectroscopic and coverage dependent structure in delta R/R for the chemisorption of the gases on W(100) are discussed.
Dissert. Abstr.

N79-21896 Michigan Univ., Ann Arbor.
VERIFICATION OF A RADIATION MODEL: REFLECTANCE FROM BODIES OF WATER TRACEABLE TO SUSPENDED PARTICULATES Ph.D. Thesis
Sergio CamachoLara 1978 181 p
Avail: Univ. Microfilms Order No. 7907039

The validity and accuracy of a reflectance model which attempts to identify and quantify the particulates suspended in bodies of water based on their solar radiation reflectance spectrum was tested. The bi-directional reflectance spectra predicted by the model are compared to the measured spectra from two lakes and a river. When the optical properties of the suspended particulates are independently determined and used with their corresponding number densities in the reflectance model, the discrepancies between the predicted and the measured reflectance are within 15%, on the average, in the wavelength interval of 400 nm to 750 nm. An experiment with different shapes of the same algae, Spirulina, shows that the geometry of the particulates is more important in determining the magnitude of the reflectance from the suspension than the number density of particulates. A method is proposed whereby the particulate content in any body of water may be identified and quantified. Dissert. Abstr.

N79-21897 Brown Univ., Providence, R. I.
IDENTIFICATION OF COPPER-SULFUR COMPOUNDS USING FAR INFRARED SPECTROSCOPIC TECHNIQUES Ph.D. Thesis

Shivaling Shrishail MahantShetti 1978 102 p
Avail: Univ. Microfilms Order No. 7906578

Reflectances of many samples with several stoichiometric compositions and thicknesses were studied in the region 50 to 100 cm at both room temperature (RT) and liquid nitrogen temperature (LN). Two maxima were observed in the ratio of reflectance at LN to RT in Chalcocite and Djurleite samples, Cu1.9 S anc Cu1.8S samples did not show any structure. On the basis of the position of the maxima and their relative amplitudes, non-destructive identification of compounds in the range x = 2.00 to x = 1.96 was possible. Absolute reflectance for chalcocite at RT and LN was explained using a dielectric function containing two damped Lorentzian oscillators with a contribution from overdamped plasma oscillations. The ratio of vibrational frequencies was calculated on the basis of a model with a fixed copper lattice. The calculated ratio was within about 30% of the experimentally obtained value. Dissert. Abstr.

N79-21898# RCA Labs., Princeton, N. J.
OPTIMIZATION STUDY OF IR-CCD ARRAY Final Technical Report, 15 Apr. 1977 - 11 Mar. 1978
W. F. Kosonocky, E. S. Kohn, and F. V. Shallcross Griffiss AFB, N. Y. RADC Nov. 1978 63 p refs
(Contract F19628-77-C-0172; AF Proj. 4600)
(AD-A063240; PRRL-78-CR-21; RADC-TR-78-259) Avail: NTIS HC A04/MF A01 CSCL 17/5

The IR-CCD arrays with platinum silicide Schottky-barrier detectors fabricated under this contract contain a 25x50-element area sensor and a 62-element line sensor. The above devices were processed with two-level polysilicon-gate buried-channel CCD registers for image readout. The platinum silicide detectors were made with implanted n-type guard rings. Such construction resulted in sufficiently low detector dark current at 77 K to allow frame-integration times of 30 to 100 ms. The process optimization included high-temperature sintering of the platinum silicide either at 650 deg for 10 minutes or for 30 minutes followed by a 20-minute hydrogen anneal at 550 C. Devices were also made with low-temperature sintering of platinum silicide at 320 C for 8 h in nitrogen followed by another 8 h in forming gas. Author (GRA)

N79-21899# Visidyne, Inc., Burlington, Mass.
BACKGROUND SUPPRESSION IN DOUBLE-BEAM INTERFEROMETRY USING TAILORED MODULATION TRANSFER FUNCTIONS
T. F. Zehnpfenning and G. A. Vanasse 18 Sep. 1978 16 p refs
(Contract F19628-77-C-0218; F19628-76-C-0198; AF Proj. 2310)
(AD-A063030; AFGL-TR-78-0221; AFGL-IP-271) Avail: NTIS HC A02/MF A01 CSCL 20/6

An optical background suppression technique is described in which the lower spatial frequencies of a background field are effectively suppressed, thereby enhancing the detectability of point-like targets. The technique is particularly applicable for use in image-forming double-beam interferometers in which the individual detector elements are matched to the diffraction-limited resolution of the instrument. The technique utilizes pairs of optical systems whose modulation transfer functions are suitably matched and a number of these pairs are described. Author (GRA)

N79-21900# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THE ARC-SECOND ALIGNMENT OF SUN-SEEKING OPTICAL DETECTORS Interim Report
C. K. Howey and D. L. McKenzie 22 Dec. 1978 16 p refs
(Contract F04701-78-C-0079)
(AD-A063639; TR-0079(4960-01)-1; SAMSO-TR-78-143) Avail: NTIS HC A02/MF A01 CSCL 22/2

The CRLS-229 Solar X-ray Spectrometer/Spectroheliograph experiment to be flown on the USAF Space Test Program (STP) P78-1 satellite uses crossed Refractosyn sun detectors to verify the satellite solar pointing. A technique utilizing solar radiation was devised to find the relationship between each detector's null axis and the normal to its flat front surface. The front surface is then used, with an autocollimator, to align the detectors to the experiment view axis. This report describes the alignment procedure and alignment tests performed with the payload installed in the spacecraft. Author (GRA)

N79-21901# Naval Research Lab., Washington, D. C.
SENSITIVITY ANALYSIS OF THE SAGNAC-EFFECT, OPTICAL-FIBER, RING INTERFEROMETER Interim Report
Shih-Chun Lin and Thomas P. Giallorenzi 16 Nov. 1978 39 p refs
(WF2124000)
(AD-A063316; NRL-8250) Avail: NTIS HC A03/MF A01 CSCL 17/8

The sensitivity of a recently reported optical-fiber, ring interferometer as a gyro has been analyzed. Photomixing signal-to-noise ratios were derived for the detection schemes using outputs based on both single and complementary fringes. Light-scattering processes, ubiquitous in the optical fiber, such as the Rayleigh, Brillouin, Mie, and core-cladding interface scattering, are assessed quantitatively because they induce, as does the signal, shot noises that set an upper limit to the minimum-detectable rotational rate. Mode stripping is a necessary feature because it can reduce the trapped scattered light level by about a factor of 100. A thorough discussion of the problems and their solutions associated with the dc detector scheme reveals that, in order to achieve the highest photon-noise-limited sensitivity, a nonreciprocal 90 deg phase bias with phase modulation, or a heterodyne technique, is essential. Optimum gyro sensitivities are discussed via numerical examples in terms of laser input wavelengths and power limits. Results show that a longer wavelength such as 1.1 micrometers is more desirable than a shorter wavelength such as 0.633 micrometers because at lambda 1.1 micrometers the fiber's ultimate scattering loss rate is much lower, hence longer fibers can be used to increase sensitivity; and that high-power operation where the only noise is due to stimulated Brillouin scattering gives a better sensitivity than the lower power case. GRA

N79-21902# Naval Weapons Center, China Lake, Calif.
PYROELECTRIC SURFACE ACOUSTIC WAVE SCANNED IMAGER ANALYSIS AND TESTING
J. P. Rahn May 1978 17 p
(WF54584601)
(AD-A063728; GIDEP-E107-2358; NWC-TM-3333) Avail: NTIS HC A02/MF A01 CSCL 17/5

This report covers information on pyroelectric imaging using SAW scanning. The results are applicable to other methods of image scanning as well. The possibility of using surface acoustic waves (SAWs) to scan optical images on semiconductors has been demonstrated. In order to do the analogous scanning of images in the infrared portion of the spectrum one has to cool the semiconductor to about 100 K. This increases initial system cost, decreases shelf life span, and requires additional servicing when operationally deployed. One method of circumventing the cooling problem is to use the pyroelectrical effect for the infrared light sensing mechanism. When heated by incident radiation a pyroelectric develops a polarization surface charge. This polarization surface charge can exert an electric field on an adjacent semiconductor and change the charge distribution at its surface. If two SAWs in the pyroelectric interact nonlinearly with the varying surface charge in the semiconductor, then one can read out an image by observing the current versus time across the semiconductor. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N79-21903 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DISCHARGE PROCESSES IN THE OXYGEN PLASMA Ph.D. Thesis
John W. Dettmer 1978 312 p
Avail: Univ. Microfilms Order No. 7908877

The electric glow discharge in oxygen was experimentally studied and mathematically modeled for the parameter space of

one to ten torr of pressure and for current densities up to 35 milliamperes per square centimeter. Experimentally it was observed that the oxgyen discharge existed in one of two forms: a high-electric-field form or a low-electric field form. The high field form was present at high currents and low pressures, the low field form at low currents and high pressures. The high field form exhibited stable characteristics while the low field form was observed to be nonstable, exhibiting periodic or aperiodic oscillatory behavior. The periodic oscillations existed only at certain frequencies or modes, and the discharge impedance was a function of the frequency. The optical output of the oscillatory form of the discharge was highly modulated with short duty cycle pulses. Dissert. Abstr.

N79-21904 Columbia Univ., New York.
NUMERICAL SIMULATION STUDIES OF TOROIDAL PINCHES Ph.D. Thesis
Wonchull Park 1978 156 p
Avail: Univ. Microfilms Order No. 7908627

A previously developed time dependent two-dimensional MHD calculation for pinch experiments was modified so that very long calculations (until the plasma reaches a quasi-equilibrium state) are possible. The calculation method is presented and the simulation results of the Jutphaas screw pinch SP-1 and the Los Alamos reverse-field pinches ZT-I, ZT-S and ZT-40 are studied. A simulation predicting ZT-40 behavior is presented. The basic differences of ZT-40 from smaller ZT-I and ZT-S are discussed from both physical and numerical view points. The scaling law of the dissipative MHD equations is derived. The important time scales, i.e., Alfven, field diffusion, thermal diffusion, viscous dissipation and numerical viscous dissipation time scales, are studied. Dissert. Abstr.

N79-21905# Los Alamos Scientific Lab., N. Mex.
LASER FUSION PROGRAM AT LASL Progress Report, 1 Jul. - 31 Dec. 1977
Frederick Skoberne, comp. Dec. 1978 186 p refs
(Contract W-7405-eng-36)
(LA-7328-PR) Avail: NTIS HC A09/MF A01

Progress in the development of high-energy short-pulse CO2 laser systems for fusion research is reported. Among the achievements discussed are an increase in on-target energy of the two-beam system to 375 J per beam; operation of one eight-beam system module at the design point of 1.2kJ at a power of more than 2 TW; and the on-schedule development of the 100- to 200-TW laser Antares. Target designs based on the LASNEX code incorporating new theoretical insights are described, culminating in a double-shell exploding-pusher target that attains a high degree of symmetry through hot-electron transport in an exploding outer shell. Significant improvements in the fabrication and inspection of targets are reported, as well as advances in the development of promising new materials such as low-density, small-cell plastic foams and ammonia borane, which was formed successfully into microballoons for the first time. Studies of laser light absorption are outlined. Unique diagnostics are described, which permit measurement of the properties of X-ray emission not previously accessible, and which provide absorption data of sufficient accuracy for direct comparison with theory. A.R.H.

N79-21906# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THE DEVELOPMENT OF SOLITON PHYSICS: AN ANALYSIS BASED ON INFORMATION RETRIEVAL
Yoshi H. Ichikawa, Takeru Ohe, and Yasumasa Kanda [1977] 23 p refs
(IPPJ-362) Avail: NTIS HC A02/MF A01

Information retrieval is used from available data bases such as INSPEC tapes in an attempt to quantify and demonstrate trends in the recent development of Soliton physics research. The date shows that Soliton physics research may be classified into three stages according to the annual numbers of published scientific papers (N): Stage 1, N - 10 0 1 Gestation (up to 1965); Stage 2, N - 10 1 10 Introduction (1966 - 1971); Stage 3, N - 10 2 100 Growth (1971 - present). G.Y.

N79-21907# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NUMERICAL INVESTIGATION OF CURRENT DRIVEN DISSIPATIVE DRIFT WAVE TURBULENCE INCLUDING FINITE BETA AND QUASILINEAR EFFECTS IN A TOKAMAK PLASMA
Jan Weiland 1979 32 p refs
(IPPJ-361) Avail: NTIS HC A03/MF A01

Excitation of dissipative drift wave turbulence with waves propagating perpendicular to the density gradient is studied numerically, taking an average over the gradient coordinate. Both situations where the plasma current is the main source of instability and situations more close to an ordinary dissipative drift wave excitation were investigated in the presence of finite beta effects and ion viscosity. The main saturation mechanism is quasilinear modification of the background density. Author

N79-21908# Maryland Univ., College Park. Dept. of Physics and Astronomy.
BILLOUIN AND RAMAN SCATTERING OF AN EXTRAORDINARY MODE IN A MAGNETIZED PLASMA
C. Grebogi and C. S. Liu Nov. 1978 21 p refs
(Contract N00014-77-C-0590)
(AD-A063061; PUB-79-004) Avail: NTIS HC A02/MF A01 CSCL 10/1

The effects of magnetic field on the stimulated Brillouin and Raman scattering processes are studied. The formalism applies to plasmas produced by CO2 lasers and to electron cyclotron heating of toroidal systems by an extraordinary electromagnetic wave. In the case of laser fusion the plasma is magnetized due to the self-generated dc magnetic field which in toroidal plasmas is due to the external magnetic field. The magnetic field greatly reduces the threshold for Brillouin backscattering by the lower hybrid wave. The Raman scattering by the upper hybrid wave has substantial growth rate even for large k(lambdo sub D) because of the lack of Landau damping. Author (GRA)

N79-21909# Naval Research Lab., Washington, D. C.
GENERATION OF A REVERSED FIELD CONFIGURATION WITHOUT AN APPLIED MAGNETIC FIELD Interim Report
J. D. Sethian, K. A. Gerber, D. N. Spector, and A. E. Robson Aug. 1978 16 p refs
(AD-A063373; AD-E000244; NRL-MR-3815) Avail: NTIS HC A02/MF A01 CSCL 20/9

A rotating relativistic electron beam, charge but not current-neutralized and exceeding the Alfven limit, has been propagated down a closed metal tube in the absence of an external guide field. The radial equilibrium is determined by the self fields of the beam and the induced wall currents. The 100 nsec duration beam, upon leaving the system, induces plasma currents that maintain a field reversed configuration for 18 microseconds. Author (GRA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N79-21910* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD FOR THE PREPARATION OF INORGANIC SINGLE CRYSTAL AND POLYCRYSTALLINE ELECTRONIC MATERIALS Patent
Warren O. Groves, inventor (to NASA) (Monsanto Co., St. Louis, Mo.) Issued 25 Feb. 1969 3 p Filed 5 Feb. 1965 Sponsored by NASA
(NASA-Case-XLE-02545-1; US-Patent-3,429,756; US-Patent-Appl-SN-430748; US-Patent-Class-156-17) Avail: US Patent and Trademark Office CSCL 20B

Large area, semiconductor crystals selected from group 3-5 compounds and alloys are provided for semiconductor device fabrication by the use of a selective etching operation which completely removes the substrate on which the desired crystal was deposited. The substrate, selected from the same group as the single crystal, has a higher solution rate than the epitaxial single crystal which is essentially unaffected by the etching solution. The preparation of gallium phosphide single crystals using a gallium arsenide substrate and a concentrated nitric acid etching solution is described. A.R.H.

N79-21911 State Univ. of New York at Stony Brook.
A CHEMICAL AND PETROGRAPHIC STUDY OF THE CHONDRULES, IN THE UNEQUILIBRATED ORDINARY CHONDRITES, SEMARKONA AND KRYMKA Ph.D. Thesis
Jonathan Webster Snellenburg 1978 187 p
Avail: Univ. Microfilms Order No. 7907569

Chondrules in the unequilibrated ordinary chondrites, Semarkona and Krymka, are porphyries with variable amounts of olivine and pyroxene phenocrysts. Petrographically distinct chondrules contain minerals with characteristic major and minor element abundances. As the ratio of pyroxene to olivine phenocrysts increased, the inferred Fe content of the parent liquids of porphyritic chondrules decreased. Among non-porphyritic chondrules, the opposite is true: pyroxene-rich chondrules are most Fe rich. Minor elements in both silicate and metal reflect the variation in Fe. During the crystallization of the chondrules in Semarkona and Krymka, the relative abundance in coexisting phases of elements that occur in more than oxidation state (Fe, Cr) varied with respect to those occurring in only one. These trends are explained by phase relations in the system.
Dissert. Abstr.

N79-21912 Pennsylvania State Univ., University Park.
MOESSBAUER SPECTROSCOPY OF LOW SPIN FERRIC HEME COMPOUNDS Ph.D. Thesis
Doyle Wayne Rhynard 1978 133 p
Avail: Univ. Microfilms Order No. 7909119

The low spin ferric ions that were studied exhibit slowly relaxing paramagnetic behavior below 20 K, and the spectra are dominated by the magnetic hyperfine interactions. Above 40 K, fast relaxation occurs, and at 77 K only asymmetric quadrupole peaks remain. The samples included in this study are some hemoproteins. A computer program was used to generate angle averaged Moessbauer spectra. A triclinic crystal field model, which considered rhombic fields rotated relative to the cubic crystal field, was used to calculate the spectra. The crystal field parameters and the hyperfine scaling factors were optimized by a least-squares fitting procedure. Good fits to the experimental data were achieved for all of the heme compounds. The rotation angles for the g-tensors of MbN3 and MbCN obtained from the Moessbauer spectra are compared with previous single crystal EPR measurements. Dissert. Abstr.

N79-21913 Institute of Paper Chemistry, Appleton, Wis.
AN INVESTIGATION OF THE VIBRATIONAL SPECTRA OF THE INOSITOLS Ph.D. Thesis
Robert Mason Williams 1977 383 p
Avail: Univ. Microfilms Order No. 7907015

The vibrational spectra of seven of the inositol isomers were investigated and interpreted based on comprehensive normal coordinate analyses. The room temperature and liquid nitrogen temperature Raman and infrared spectra of crystalline samples of the seven inositol isomers were recorded as well as for the oxygen deuterated analogues of scyllo-inositol, neo-inositol, myo-inositol and epi-inositol. In conjunction with the normal coordinate calculations, a 33-parameter modified valence force field was developed. The calculated potential energy distributions showed a majority of the vibrations to be composed of complex atomic motions with extensive coupling of all the different types of motions which occur below 1500 cm. Vibrational energies calculated for the preferred and alternate conformations of the inositols were compared with the conformational energies calculated using nonbonded interaction energies. Dissert. Abstr.

N79-21914 Oklahoma Univ., Norman.
OPTICALLY STIMULATED EXOELECTRON EMISSION FROM POTASSIUM CHLORIDE SINGLE CRYSTALS Ph.D. Thesis
George Michael Renfro 1978 111 p
Avail: Univ. Microfilms Order No. 7908836

The optically stimulated excelectron emission spectrum of KCl was studied in the wavelength region of 300 nm to 650 nm under high vacuum using channel electron multiplier techniques. Samples were irradiated with the 3 keV electron beam at room temperature. It was found that features of the emission spectrum from single crystal samples are similar to those of powdered samples, but details differ. Exoemission peaks which correspond to the F, K, and L sub 1 optical absorption bands were detected. An emission peak appears at 395 nm corresponding to the high energy tail of the K-band. With increasing surface damage (i.e. with cumulative dose) the F-band emission is destroyed while higher energy peaks persist. Increasing temperature produces a shift in the F-band to longer wavelengths and an increase in emission intensity.
Dissert. Abstr.

N79-21915 Ohio State Univ., Columbus.
SURFACE TORQUES AND THEIR EFFECTS ON THE BOUNDARY PARAMETERS IN FERROMAGNETIC INSULATOR THIN FILMS Ph.D. Thesis
Herbert Richard Summers 1978 101 p
Avail: Univ. Microfilms Order No. 7908224

The analysis of the spin wave spectrum in a magnetic insulator thin film is dependent on the characterization of the interactions occurring at the surfaces of the film. From the characterization of the surfaces a model was developed that describes the behavior of the spin wave spectrum. Angular variation and frequency dependence of the boundary parameter were investigated in single crystal LPE and CVD thin films of Yttrium Iron Garnet. A uniaxial surface anisotropy energy that produces 'Non-Parallel' ground states with the spins near the surface aligning at angles canted to the bulk spin direction is described. This 'Non-Parallel' ground state predicts a frequency dependence and an angle dependence in the boundary parameter. Calculations are made of the magnitudes of the unixial surface anistropy energy and the isotropic boundary parameter. Dissert. Abstr.

N79-21916 Brown Univ., Providence, R. I.
EXPERIMENTAL STUDY OF TWO-DIMENSIONAL PLASMONS IN THE INVERSION LAYER OF A METAL-OXIDE-SEMICONDUCTOR STRUCTURE Ph.D. Thesis
Thomas Nicholas Theis 1978 127 p
Avail: Univ. Microfilms Order No. 7906620

A method is developed for coupling a far infrared radiation field to plasmons in the two-dimensional electron gas formed by the inversion layer of the metal-insulator-semiconductor (MOS) structure. The coupling is mediated by a metallic grating which forms an integral part of the MOS device. A theory describing the coupling is developed and used to interpret the experimental data. Two major experiments are described. The first tests the wave number dependence of the two-dimensional plasmon dispersion relationship. The second studies the magnetoplasmon dispersion relationship in a two-dimensional system. The majority of the experimental results are described in terms of the classically predicted plasmon and magnetoplasmon behavior. However, interesting quantum effects in the dispersion are also observed, especially under the influence of a magnetic field. The usefulness of the plasmons as a new probe of the physics of the inversion layer system is treated as a recurring theme throughout the discussion. Dissert. Abstr.

N79-21917 Syracuse Univ., N. Y.
THE INITIAL STAGES OF THE EPITAXIAL OXIDATION OF (111) Cu TO Cu2O Ph.D. Thesis
Jackson Hing-Chin Ho 1978 85 p
Avail: Univ. Microfilms Order No. 7908537

The techniques of ultra high vacuum reflection high energy electron diffraction, transmission electron microscopy, and thin film epitaxial growth were combined to investigate the structural and microstructural aspects of the initial stages of the oxidation of Cu. Monocrystalline bilayers consisting of a thin (111) Cu2O overgrowth on a thick (111) Cu substrate were used. Oxidation took place in-situ in the reflection diffraction instrument. A new laminar oxide morphology was observed to form. Misfit dislocations were present at the metal oxide interface. Evidence was also obtained that indicated preferred oxide nucleation at atomic steps on the surface of the copper film. Annealing experiments carried out in the electron microscope showed that rapid interdiffusion of the oxide and the copper substrate occured at temperatures as low as 50 C. During the interdiffusion process the misfit dislocation density was reduced to zero, and oxide reflections disappeared from the TED patterns after sufficient annealing at high temperatures. Dissert. Abstr.

N79-21918 California Univ., Los Angeles.
A STUDY OF TIN MONOSELENIDE AND TIN DISELENIDE

SEMICONDUCTING COMPOUNDS AND A TIN MONOSELENIDE-TIN DISELENIDE SEMICONDUCTING EUTECTIC Ph.D. Thesis
Jiann Gwo Yu 1978 128 p
Avail: Univ. Microfilms Order No. 7907698

The SnSe-SnSe2 eutectic grown by the Bridgman technique has a multi-P/N junction lamellar microstructure. However, no plasma frequency was detected in its infrared reflectance spectrum up to 40 micrometers of wavelength. This suggested that the SnSe-SnSe2 eutectic is nondegenerate. As-grown SnSe2 single crystals have hexagonal crystallographic structure and show N-type conductivity. Polycrystalline SnSe and SnSe2 films were successfully prepared in a high vacuum using a close-space-vapor-transport technique. The index of reflection for SnSe single crystal was determined from a wavelength of 3 micrometers to a wavelength of 40 micrometers and was found to be 3.120 at 3 microns and 3.095 at 15 microns. An indirect band gap of 0.922 eV was obtained from the photoresponse measurement on a SnSe diode which is consistent with a value of 0.923 eV, obtained from the optical absorption measurement of thin SnSe wafers. Dissert. Abstr.

N79-21919 Brown Univ., Providence, R. I.
THE EFFECTS OF PLASTIC DEFORMATION ON THE ELECTRICAL TRANSPORT AND OPTICAL PROPERTIES OF CdS, CdSe AND ZnS Ph.D. Thesis
Paul Philip Merchant 1978 186 p
Avail: Univ. Microfilms Order No. 7906585

Samples of CdS, CdSe and ZnS were plastically deformed at elevated temperatures (570 C - 750 C) over a range of strains from 0 percent to 28 percent. The electrical conductivity was measured along selected crystallographic directions in the temperature range from 300 K to 20 K. Hall effect measurements, complementing the conductivity results, were carried out at 300 K and 77 K. Optical transmission and reflectivity measurements were carried out over a spectral region ranging from the far infrared through the ultraviolet, for temperatures between 300 K and 90 K. A model was developed, which accounts for the observed changes in these properties after plastic deformation, in terms of changes in electronic properties of states located in the fundamental gap between the valence and conduction bands of these compounds. This model consists of the introduction of pseudo-one-dimensional energy bands associated with electrons bound to dislocations, which are located near the valence band extrema in the fundamental gap. All of the observed changes were found to be consistent with this model. Dissert. Abstr.

N79-21920 Illinois Univ. at Chicago Circle, Chicago.
POSITRON AND ELECTRON ENERGY BANDS AND WAVE-FUNCTIONS, FERMI SURFACE, DENSITY OF STATES, HALL COEFFICIENT AND POSITRON ANNIHILATION IN BERYLLIUM, USING A NEW TECHNIQUE FOR BRILLOUIN ZONE INTEGRATION Ph.D. Thesis
Joseph Oladipupo Olaleye Oriade 1978 178 p
Avail: Univ. Microfilms Order No. 7908415

The use of an accurate band structure and analytical biquadratic scheme produced accurate densities of states for Be. For the first time the Fermi energy is found at a position consistent with the observed hole conductivity in Be. The Hall coefficient is calculated from band structure; the value obtained for Be is in excellent agreement with experiment. The calculated Fermi surface of Be also is in excellent agreement with experiment. The calculated angular distribution of annihilation photons, ADAP, and the positron lifetime, were found to depend strongly on the electron and positron charge densities and on the electron group velocities. The calculated angular distribution, ADAP, was found also to depend strongly on the electron Bloch functions, and on the shape of the Fermi surface. Both the calculated and the experimental ADAP curves were found to deviate strongly from the free-electron parabola. Dissert. Abstr.

N79-21921*# National Aeronautics and Space Administration, Washington, D. C.
X-RAY INVESTIGATION OF MOLTEN CRYSTAL HYDRATES H2SO4(nH2O) AND HNO3(nH2O)
A. V. Romanova and A. F. Skryshevskiy Apr. 1979 13 p ref Transl. into ENGLISH from Vop. Fiz. Metallov i Metallovd., Akad. Nauk Ukr. (USSR), no. 4, 1953 p 70-76 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75418) Avail: NTIS HC A02/MF A01 CSCL 20B

Integral analysis of the intensity of the electron density distribution curve in molten crystal hydrates provided by X-ray analysis, permits the following conclusions on the structure of the complex SO and NO ions, and the short-range order in the structure of the solution. The SO4 ion in the solution has a tetrahedral structure with an S to O distance equal to 1.5 A. For the NO3 in the solution, a planar triangular shape is probable, with an N to O distance equal to 1.2 A. Preferential distances between each of the oxygens of the SO ion and the nearest molecules of water proved near to the corresponding distances in solid crystal hydrates. For an (H2SO4)(H2O) solution, the average number of water molecules surrounding each oxygen atom of the SO4 (--) ion was on the order of 1.3 molecules. Hence the preferential distances between the water molecules and the oxygen atoms of the SO ion, and the preference of their mutual position, correspond to the fixed position of these same elements of the structure in the solid crystal hydrate.
A.R.H.

N79-21922*# Massachusetts Inst. of Tech., Cambridge.
SOLIDIFICATION (CRYSTAL GROWTH) IN THE PRESENCE OF GRAVITATIONAL FORCES Final Report, 30 Nov. 1977 - 31 Aug. 1978
Harry C. Gatos and August F. Witt 31 Aug. 1978 5 p refs
(Contract NAS8-30537)
(NASA-CR-161195) Avail: NTIS HC A02/MF A01 CSCL 20B

The surface tension behavior of doped and undoped InSb melts was investigated as well as their temperature and composition dependence. Surface tension in InSb melts was determined using the sessile-drop technique covering the temperature range from 530 C to 880 C. A linear regression of the data obtained shows that the temperature dependence of sigma is 392- (T-530) x (7000) plus or minus 10 dyne/cm. The d sigma/d Tau for intrinsics InSb is less than that previously reported. On the basis of the surface tension data obtained, it is concluded that surface tension induced convective flow velocities in InSb under reduced gravity conditions range from zero to at most 1 cm/sec. Accordingly, no interference with dopant segregation can be expected during growth in space because the momentum boundary layer (at the crystal melt interface) associated with any Marangoni-type convective flows would, at the given growth rate, be significantly larger than the predicted diffusion boundary layer thickness. A.R.H.

N79-21923*# Army Military Personnel Center, Alexandria, Va.
NEW OPTICAL METHOD FOR STUDYING DEFECTS IN SILICON M.S. Thesis - Rensselaer Polytechnic Inst.
Michael T. Mitchell Dec. 1978 40 p refs Presented in part at 10th Intern. Conf. on Defects and Radiation Effects in Semiconductors. Inst. Phys. Conf. Ser. no. 46, 1979
(AD-A063141) Avail: NTIS HC A03/MF A01 CSCL 20/12

A new optical method incorporating two monochromatic light beams incident on the sample whose temperature is at approximately 78 K is used to study infrared active radiation-induced defect absorption bands. Defect energy levels, photoionization excitation and deexcitation processes were examined for the divacancy associated bands found in the 3 - 3.6 micron wavelength region and two higher order bands which appear in the 7 to 14 micron wavelength region. For the divacancy band region 100hms-cm and 0.10hm-cm n-type (P-doped) crucible grown silicon irradiated to 5 x 10 to the 18th power neutrons/sq cm (E = 1 MeV) were examined. An excitation energy (E sub e) of width 0.81eV to 0.89eV was found to produce an absorption throughout the entire 3.3 micron absorption band region with a maximum absorption occuring around 3.1 micron. A model is proposed which incorporates direct band gap transitions. A 200ohm-cm p-type (B-doped) crucible grown silicon sample irradiated to 5 x 10 to the 18th power neutrons/sq cm (E = 1 MeV) and annealed at 500 C for 15 minutes was examined for higher order bands. The 9.54 micron and 9.08 micron bands were found to have a maximum absorption for band gap energy. A model is proposed for the photoionization process incorporating the band gap energy for absorption and a depletion energy of 0.74eV. Author (GRA)

N79-21924# Naval Research Lab., Washington, D. C.
THE ELECTRONIC AND ELECTRO-OPTIC FUTURE OF III-V SEMICONDUCTOR COMPOUNDS
H. Lessoff and J. K. Kennedy (RADC, Bedford, Mass.) 1 Dec. 1978 23 p refs
(AD-A061869; NRL-MR-3888) Avail: NTIS HC A02/MF A01 CSCL 20/12

An assessment of material development of III-V compounds for electro-optic, microwave and millimeter wave technology is presented. Questions concerning material selection, needs and processing is addressed. Author (GRA)

N79-21925# United Technologies Research Center, East Hartford, Conn.
FABRICATION OF SPUTTERED ALUMINUM NITRIDE ON SAPPHIRE FOR APPLICATION IN UHF SAW FREQUENCY FILTERS Final Technical Report, 1 Jul. 1977 - 1 Jun. 1978
Edouard L. Paradis and Thomas M. Reeder Griffiss AFB, N. Y. RADC Sep. 1978 58 p refs
(Contract F19628-77-C-0188; AF Proj. 4600)
(AD-A063396; UTRC/R78-922937-4; RADC-TR-78-2) Avail: NTIS HC A04/MF A01 CSCL 20/14

Single crystal AlN films were grown by sputtering on single crystal (0001) oriented sapphire substrates. The substrate size was 25.4 x 9.0 x 2.0 mm. This size was chosen as a convenient size for the fabrication of UHF SAW frequency filters. The AlN was synthesized by reactive rf diode sputtering of a pure aluminum target in an ammonia atmosphere. Growth conditions were established which yielded clear, uniform, single crystal AlN films. Films were evaluated through microscopic examinations, interference spectrophotometric thickness measurement and electron channeling and X-ray diffractometer crystallographic analysis. Films ranged from 2 micrometers to 2.3 micrometers in thickness and were uniform to less than 0.1 micrometers across the long dimension of the substrate. Films were single crystal with the (0001) A1N direction parallel to the (0001) Al2O3 direction. Films were clear and smooth replicating the surface of the substrate. Twelve samples were delivered in accordance with the requirements of this program. Surface acoustic wave interdigital electrode transducers and delay lines were fabricated on samples identical to those delivered. Measurements of delay line performance at 201, 477, and 848 MHz were made to provide an estimate of the basic constants for surface acoustic wave excitation and wave propagation. Relatively low acoustic propagation loss was observed for all AlN on sapphire delay lines studied. Author (GRA)

N79-21926# Colorado State Univ., Fort Collins. Dept. of Physics.
DIELECTRICAL LAYERS ON 3-5 SEMICONDUCTORS Annual Report, 15 Jun. 1977 - 14 Jun. 1978
James R. Sites 1 Jul. 1978 14 p
(Contract N00014-76-C-0976; NR Proj. 243-015; RR021203)
(AD-A063332; SF16) Avail: NTIS HC A02/MF A01 CSCL 20/12

Studies on the electronic profile of InAs epilayers were completed. The use of ion beam sputtered silicon nitride as an encapsulant was reported and the project extended to aluminum nitride. A new sputter system was installed, and details of ion beam sputter damage are being examined. Author (GRA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N79-21927 Northwestern Univ., Evanston, Ill.
CALCULATION OF SOME THERMODYNAMIC AND OPTICAL PROPERTIES OF LIQUIDS AND LIQUID MIXTURES Ph.D. Thesis
Lewis Leo Justen 1978 142 p
Avail: Univ. Microfilms Order No. 7907893

Various optical and thermodynamic properties of liquids were studied. A model which explains the relationship between the index of refraction, density and molar refraction was developed, taking into account shielded and unshielded electrons in a molecule. This model is shown to adequately represent refractive index and density data of pure liquids. It is shown to be consistent with the optical properties of binary and ternary solutions. Two equations were developed which allow the calculation of the excess free energy of mixing of binary solutions. The first is a generalized form of the Scatchard-Hildebrand Equation and is totally empirical. The second accounts for the effect of excess volume of mixing on excess free energy. The shielded electron model for optical properties of liquids was applied to the calculation of cohesive energies of pure liquids. Dissert. Abstr.

N79-21928 Pennsylvania Univ., Philadelphia.
CURVED SPACE ELECTRODYNAMICS Ph.D. Thesis
Michael Wesley Kearney 1978 382 p
Avail: Univ. Microfilms Order No. 7908755

The properties of Maxwell's equations and their solutions in a curved spacetime background are treated. A number of calculations involving the production and propagation of electromagnetic waves in the Schwarzschild metric are presented. The power radiated from a radially vibrating neutron star is calculated and it was found that the radiation can be hypermissive. The fields surrounding and the power radiated by a slowly rotating neutron star with a frozen-in magnetic dipole field, tilted with respect to the rotation axis are calculated, including the effects of spacetime curvature. Numerical results are found using power series which describe the behavior of electromagnetic fields exterior to a black hole or slowly rotating neutron star. Dissert. Abstr.

N79-21929# National Technical Information Service, Springfield, Va.
QUANTUM ELECTRODYNAMICS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Feb. 1979
Brian Carrigan Mar. 1979 222 p Supersedes NTIS/PS-77/0169; NTIS/PS-76/0132; NTIS/PS-75/238 (NTIS/PS-79/0075/6; NTIS/PS-78/0162; NTIS/PS-77/0169; NTIS/PS-76/0132; NTIS/PS-75/238) Avail: NTIS HC $28.00/MF $28.00 CSCL 20J

Studies of causality, gauge invariance, radiative corrections, symmetry, and vacuum polarization in quantum electrodynamics are cited. (This updated bibliography contains 215 abstracts, 25 of which are new entries to the previous edition.) GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N79-21930 Ohio State Univ., Columbus.
AN ANALYSIS AND EVALUATION OF STRUCTURED DECISION SYSTEMS Ph.D. Thesis
Mary Jane Lee 1978 294 p
Avail: Univ. Microfilms Order No. 7908169

A basis for a systematic, performance-oriented methodology was analyzed for representing and evaluating complete decision systems. Markovian and Bayesian probability techniques were utilized to analyze the sequences of states. The Markov analysis showed that levels of performance with respect to criterion specifications are directly associated with the levels and quantity of information displayed. The major results of the Bayesian

convergence and discriminability analysis were that high convergence rates to steady-state transition probabilities of the Markov analysis and high discriminability were indicated in displays containing both high and low levels of information while low convergence rates and discriminability were found in displays with low levels of information displayed. From the development of the conceptual representation of complete decision systems and Markov chain analysis of the system, a formal decision systems model evolved as a stochastic finite state machine.
Dissert. Abstr.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N79-21931 Ohio State Univ., Columbus.
FREQUENCY OF INFORMATION IN MANAGEMENT INFORMATION SYSTEMS Ph.D. Thesis
Satish Ramanlal Desai 1978 191 p
Avail: Univ. Microfilms Order No. 7908135

A quantitative analysis was utilized to design the frequency of the management information system. A model depicting the interrelationships among information, information frequency, management control action, and management objectives is developed in the contexts of a generalized management and control system. A decision strategy to assist the decision maker in the choice of the frequency of management information was developed. Optimizing conditions are developed for the information frequency model. Some principles for the decomposition of a complex management and control problem was developed into a number of distinct simple subproblems and illustrate a modeling approach to address the information frequency problem for multi-level siutations. Dissert. Abstr.

N79-21932# Kappa Systems, Inc., Arlington, Va.
ASSESSMENT OF THE SCIENTIFIC QUALITY AND UTILITY OF REPORTS PRODUCED BY THE INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS Final Report
William G. Darnell and Monica Benderly Aug. 1978 117 p
(Contract NSF C-INT-78-11783)
(PB-291004/0; NSF/INT-78-11783) Avail: NTIS
HC A06/MF A01 CSCL 05B

The National Science Foundation is conducting an evaluation of the International Institute for Applied Systems Analysis (IIASA) which focuses upon those benefits to U. S. science derived from U. S. participation in IIASA as well as attempting to measure IIASA's progress in meeting its original objectives. While the evaluation effort has several components, the study represented by the report was directed at obtaining independent expert reviews of a subset of the research reports published by the Institute in 1976 and 1977. Twenty-one individual research reports were selected from the 44 published in 1976 and 1977. For each report four expert reviewers were selected and requested to complete evaluations of the reports according to a structured set of criteria. These criteria, developed jointly by the contractor and the Foundation, focused on scientific merit, accomplishment, utility, and format and readability. GRA

N79-21933# Harry Diamond Labs., Adelphi, Md.
AUTOMATIC DOCUMENTS STORAGE AND RETRIEVAL SYSTEMS
Barry W. Mulligan Nov. 1978 18 p ref Sponsored by the Army
(AD-A063568; HDL-TM-78-27) Avail: NTIS
HC A02/MF A01 CSCL 09/2

Automatic document storage and retrieval systems are currently available in a variety of forms. In a survey of the marketplace, these systems were compared for the storage of engineering drawings. They were characterized mainly by the type of memory device use--magnetic tape or disk, laser mass memory, microfilm, and microfiche. None matched the idealized system described in this report. New memory devices are under development: homograms, ovonic memories, magnetic bubble memories, and vesicular film. A microfiche system for an existing engineering program, a magnetic tape or disk system for starting a new program, and a combination of the two for a large ongoing program are recommended. Author (GRA)

N79-21934# California Univ., Irvine. Public Policy Research Organization.
URBIS PROJECT DISSEMINATION AND UTILIZATION REPORT, EVALUATION OF INFORMATION TECHNOLOGY IN LOCAL GOVERNMENT
6 Feb. 1978 242 p refs
(Grant NSF APR-74-12158)
(PB-291007/3; NSF/RA-780385) Avail: NTIS
HC A11/MF A01 CSCL 05B

Progress in assessing the current state of local government computing, evaluating its impact on government services and management decision making, and developing recommendations that local managers and officials can implement to make better use of information technology is reported from the standpoint of dissemination of project results and utilization of project findings by academic and practitioner audiences. The dissemination strategy presented is accompanied by summary statistics on the distribution of various working papers listed in an appendix.GRA

N79-21935# Swedish Council for Building Research, Stockholm.
RESEARCH ON CLASSIFICATION SYSTEMS: SUMMARIZING REPORT ON RESEARCH ON CLASSIFICATION SYSTEMS AND THEIR APPLICATION
Ejnar Wahlin Apr. 1978 138 p refs
(PB-290377/1; D14:1978; ISBN-91-540-2917-1) Avail: NTIS
HC A08/MF A01 CSCL 05B

Different questions concerning the structure of classification systems, considered as necessary implements for the ordering of different phenomena are addressed. The primary stress lies in the ordering of fundamental concepts and areas of knowledge in a universal context, but even classification systems for other - more practical - purposes are considered. GRA

N79-21936# King Research, Inc., Rockville, Md.
THE INFORMATION DISSEMINATION PROGRAM OF IIASA IN THE UNITED STATES Final Report
Nancy K. Roderer and Candace H. Olsen 17 Aug. 1978 250 p
(Contract NSF INT-77-27295)
(PB-291006/5; NSF/INT-77-27295) Avail: NTIS
HC A11/MF A01 CSCL 05B

The evaluation of the information dissemination program of the international institute for Applied Systems Analysis (IIASA) in the United States is reported. IIASA is a nongovernmental multinational organization formed in 1972 to initiate and support research in relation to problems of modern societies arising from scientific and technological development. There are 17 member organizations, including the U. S. National Academy of Sciences. The particular focus is on the utility of IIASA reports and conferences, i.e., the impact of the IIASA formal information dissemination system on U. S. scientists. The study was designed to take into account all aspects of a generalized information transfer cycle, including information generation, production, distribution, and use. GRA

N79-21937# National Library of Medicine, Bethesda, Md. MED-LARS Management Section.
NLM ONLINE SERVICES REFERENCE MANUAL, SUPPLEMENT 1
Jan. 1979 246 p Revised
(PB-291793/8; NLM-MED-79-01) Avail: NTIS
HC A11/MF A01 CSCL 05B

New or revised Parts of the NLM Online Services Reference Manual include: CATLINE; Part 9 - AVLINE; Part 12 - TOXLINE; Part 14 - RTECS; Part 21 - HISTLINE; Part 22 - BIOETHICS; and Part 23 - HEALTH. Also includes replacement pages for a number of other sections, as well as a new Index. GRA

N79-21938# Rhode Island Univ., Narragansett. Center for Ocean Management Studies.

INFORMATION SYSTEMS FOR COASTAL ZONE MANAGEMENT
Lance Brockmeier Jun. 1978 112 p refs
(Grant NOAA-01-9-M01-2959)
(PB-292180/7; NOAA-79012506) Avail: NTIS HC A06/MF A01 CSCL 13B

The objectives discussed at the workshop are: (1) the role of existing management systems in coastal resource planning and management; (2) how information systems may be designed or modified to help states meet their legal, technical, and economic goals for coastal zone management; (3) why certain systems are successful and other fail to meet the planner's needs for information; (4) the extent to which information systems provide interagency/inter-disciplinary cooperation; (5) the potential long-range benefits of information systems; and (6) how much, what kind, and in what form is information needed. GRA

N79-21939# SRI International Corp., Menlo Park, Calif. Computer Sciences and Technology Div.
EPC II: THE DESIGN AND EXECUTION OF AN OPERATIONAL EXPERIMENT TO TEST THE FEASIBILITY OF A COMPUTER-BASED EDITORIAL PROCESSING CENTER SHARED BY A NUMBER OF JOURNALS Final Report, Jan. 1976 - Dec. 1978
Oliver W. Whitby, Robert W. Lawrence, and Reddy Dively Apr. 1978 265 p refs
(Grant NSF DSI-75-13214; SRI Proj. 4981)
(PB-291349/9) Avail: NTIS HC A12/MF A01 CSCL 09B

Criteria are set forth that are useful in designing an editorial processing center (EPC) for a number of scientific and technical journal publishers. The computer configuration used in an operational experiment involving three journals is described. The editorial and data-processing functions for ACM's Computing Reviews are detailed and the manner of their mechanization using the facilities offered by the BTL-licensed UNIX operating system is covered. The main problems of conducting operational experiments are described. An evaluation is given of the results of the experiment and some cost estimates are advanced for the commercial application of EPCs. Observations are offered about what is considered the appropriate avenues of development for computer-aids in lowering the overall cost of scientific and technical communication through the journal channel. GRA

N79-21940# Office of Management and Budget, Washington, D. C.
FEDERAL DATA PROCESSING REORGANIZATION STUDY: CENTRAL AGENCIES TEAM REPORT
C. R. Hagener, Alton P. Jensen, Joseph C. R. Licklider, L. J. Riley, and Micro P. Snidero Dec. 1978 79 p refs
(PB-292051/0) Avail: NTIS HC A05/MF A01 CSCL 09B

The implementation of P.L. 89-306 (responsibilities for the Administration and Management of ADP Activities) by the Office of Management and Budget, General Services Administration, and Department of Commerce was investigated. The current roles of these organizations are described, the extent and causes of real or perceived problems are documented, and viable options as solutions to those problems are identified, analyzed, and discussed. Recommendations for improvement based on the options are made. GRA

N79-21941# National Bureau of Standards, Washington, D. C. Office of Standard Reference Data.
OMNIDATA: AN INTERACTIVE SYSTEM FOR DATA RETRIEVAL, STATISTICAL AND GRAPHICAL ANALYSIS, AND DATA-BASE MANAGEMENT: A USER'S MANUAL
Joseph Hilsenrath Sep. 1978 294 p refs
(PB-290349/0; NBS-Handbook-125; LC-78-600076) Avail: NTIS HC A13/MF A01 CSCL 09B

The Omnidata system, consisting of 45 individual programs written in XBASIC, provides an interactive user-oriented facility for: data retrieval and report generation; plotting and other graphical analysis; arithmetical and statistical analysis; curve fitting and multiple linear regression; data coding and decoding; survey and questionnaire analysis; author, title, and keyword indexing of bibliographic files; a variety of univariate analyses and two-way crosstabulations; and numerous utility modules for file definition, file updating, and file maintenance. The SEARCH module which performs a serial search through a file allows for: the usual Boolean operations; string searching on text fragments, stems, or roots in either the anchored or unanchored mode; specification of syntactical order and proximity of words or phrases, as well as variable length ellipsis; and ignoring one or more of a specified list of characters in its matching operation. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N79-21942 Northwestern Univ., Evanston, Ill.
EVALUATION OF FULL-SCALE-TERTIARY WASTEWATER FILTERS Ph.D. Thesis
Charles Laverne Swanson 1978 259 p
Avail: Univ. Microfilms Order No. 7907945

Semiempirical mathematical models were developed to characterize in-depth and straining filtration and were tested with independent data. If in-depth filtration was believed to be the dominant particle collection mode, inclusion of refiltration parameters in models did not result in a significant improvement in prediction. A near perfect prediction was obtained in testing the model developed from the Addison North, Des Plaines River and Romeoville plants if only data with high values of the refiltration parameter E were included. The models developed can be applied with caution in prediction of filter clarification efficiency without pilot-scale tests. The most important single consideration in the design of small scale tertiary granular media wastewater filters was the ability to handle shock loads caused by secondary process upsets. Dissert. Abstr.

N79-21943 Michigan Univ., Ann Arbor.
AN INVESTIGATION OF BIOLOGICAL NITRIFICATION USING ROTATING DISCS Ph.D. Thesis
Tai Hak Chung 1978 375 p
Avail: Univ. Microfilms Order No. 7907046

The biological oxidation of ammonia was studied using the rotating biological contactor as a support system for controlling the reaction. In the laboratory, a synthetic sewage effluent was fed to the system composed of ammonium salts, buffer and trace elements. In the field, a high rate trickling filter effluent was the substrate. Based on model simulation and experimental observations, it was found that the diffusion coefficients of the chemical species within the biofilm were significantly lower than the corresponding values in water. The results also showed that when a shock load is applied, the early stages simply passed the additional substrate to the following stages. Later stages

were able to extract portions of the additional load. Process efficiency is dependent on both the population of active nitrifiers and diffusional mass transfer within the biofilm. Dissert. Abstr.

N79-21944# Army Tank-Automotive Research and Development Command, Warren, Mich.
INTERACTIVE VEHICLE DYNAMICS AND RIDE EVALUATION PACKAGE
Francis B. Hoogterp Nov. 1978 53 p
(AD-A063589; TARADCOM-12413) Avail: NTIS HC A04/MF A01 CSCL 13/6

This report describes an integrated package for evaluating the dynamic effects of driving a vehicle across any described section of terrain. The model incorporated includes only the pitch and roll motions of the chasis (or hull). The package is composed of four digital computer programs. Each program is designed to be run interactively and does not require that the user have any programming experience. The programs provide the capability to create vehicle data files, perform simulations, and specify the form and types of the output desired. A general description of the model structure, its capabilities and its limitations is included along with user instructions for running each program in the package. Author (GRA)

N79-21945# DeLeuw, Cather and Co., Washington, D.C.
IN-SERVICE PERFORMANCE AND COSTS OF METHODS TO CONTROL URBAN RAIL SYSTEM NOISE. INITIAL TEST SERIES REPORT Interim Report, Jul. 1975 - Oct. 1977
Robert L. Shiphey and Hugh J. Saurenman Aug. 1978 414 p Prepared in cooperation with Wilson, Ihrig and Associates, Inc., Oakland, Calif.
(Contract DOT-TSC-1053)
(PB-288838/6; DOT-TSC-UMTA-78-32; UMTA-MA-06-0025-78-7) Avail: NTIS HC A18/MF A01 CSCL 13B

The acoustic and economic effectiveness of resilient wheels, damped wheels, wheel truing, and rail grinding for reducing wheel/rail noise urban rail transit systems was investigated during a six-phase series of field tests being performed on the Southeastern Pennsylvania Transportation Authority System's Market Frankford Line. Contents include: (1) the results of the testing performed in phase 1, 2 and 3 including tentative recommendations; (2) changes which have occurred to the experimental design and to the test evaluation plan; (3) economic data for the wheel types, rail grinding equipment, and wheel truing equipment under consideration; (4) a preliminary discussion of problems and enumeration of constraints which are relevant to use of these techniques on other systems; and (5) a summary of remaining testing to be accomplished. GRA

N79-21946# Municipal Environmental Research Lab., Cincinnati, Ohio. Wastewater Research Div.
URBAN STORMWATER MANAGEMENT WORKSHOP PROCEEDINGS
Richard Field Aug. 1978 130 p refs Workshop held at Edison, N. J., 1 Dec. 1977
(Contract EPA-68-03-2617; Grant EPA-R-802411)
(PB-288801/4; EPA-600/9-78-017) Avail: NTIS HC A07/MF A01 CSCL 13B

Topics covered include: urban stormwater management and technology manual (update); comprehensive planning for control of urban storm runoff and combined sewer overflows; low cost-effective alternative and comparative analysis from 208 areawide assessment study on combined sewer overflow and urban stormwater pollution; statistical characterization of runoff loading rates and cost functions of control measures; dry weather pollutant deposition in sewerage systems and associated first flush combined sewer overflow pollution control by dry weather sewer flushing; and nonpoint pollution abatement through improved street cleaning practices. GRA

N79-21947# West Virginia Univ., Morgantown. Water Research Inst.
A STUDY FOR IMPROVING THE AEROBIC-MEDIA TRICKLING FILTER FOR WASTEWATER TREATMENT
William R. Johnson, III and Charles E. Jenkins 1978 45 p refs
(Contract DI-14-31-0001-6051)
(PB-288775/0; W79-01123; OWRT-A-029-WVA(2); Information-12) Avail: NTIS HC A03/MF A01 CSCL 13B

The aerobic media consists of 276 small teflon tubes bonded into a pressurized oxygen manifold at one end of the unit and hanging in loops down the length of a vertical pipe flowing full of wastewater. Diffusion of pressurized oxygen through the very thin walls of the tubes provides the oxygen requirements. Recirculation is used to vary the hydraulic loading on the unit. Organic loading is varied by changing the concentration of the synthetic wastewater. This AMTF system accomplishes greater than 85 percent removal of BOD and is not adversely affected by excessive accumulations of slime. Its performance at high organic and hydraulic loadings indicates it would be amenable to secondary treatment of industrial and municipal wastewaters. GRA

N79-21948# National Science Foundation, Washington, D. C. Applied Science and Research Applications.
INTERGOVERNMENTAL SCIENCE AND PUBLIC TECHNOLOGY, VOLUME 2
Sep. 1978 81 p
(PB-289619/9; NSF-78-54-Vol-2; NSF/RA-780331-Vol-2; Program-Rept-6) Avail: NTIS HC A05/MF A01 CSCL 05A

The intergovernmental science and public technology (ISPT) program aims to: (1) experiment with incentives to accelerate introduction of innovation technology into commercial applications; (2) bring S&T (science and technology) into the policy making process in state and local government and (3) disseminate research results. The ISPT supports research and conducts experiments on the structure of new institutions in both the public and private sectors. These institutions represent new partnerships among universities, industries, state and local government between those who conduct research and those who utilize it. The theme is institution building with both researchers and users playing a joint, complementary role. GRA

N79-21949# Dayton Univ. Research Inst., Ohio.
TECHNOLOGY ASSESSMENT AN APPRAISAL OF THE STATE OF THE ART Final Report
Joseph P. Martino, Ralph C. Lenz, Jr., and LueiLin Chen Sep. 1978 247 p refs
(Grant NSF OPA-77-20685)
(PB-290235/1; UDRI-TR-78-81; NSF/PRA-7720685/1) Avail: NTIS HC A11/MF A01 CSCL 05A

Synthesis of the presentations and discussions of a workshop held in Dayton, Ohio in 1977 to appraise the state-of-the-art of technology is presented. Three major types of ideas about technology assessment came out of the workshop. The first of these dealt with the elements of a technology assessment, or the instrumental objectives which must be achieved during the conduct of a technology assessment, and which must be seen to have been accomplished when it is completed. The second major type had to do with the conduct of a technology assessment, that is, with the choices which have to be made before and during the performance of a technology assessment, primarily from the standpoint of carrying it out in an effective manner. The third type of idea had to do with managing a technology assessment team. GRA

N79-21950# Public Technology, Inc., Washington, D. C.
IMPROVING TRANSIT PERFORMANCE: PROCEEDINGS OF THE NATIONAL CONFERENCE
Jan. 1978 167 p Presented at 1st National Conf. on Transit Performance, Norfolk, Va., 18-21 Sep. 1977
(PB-291032/1; UMTA-DC-06-0184-78-1) Avail: NTIS HC A08/MF A01 CSCL 13B

The proceedings of the conference, namely the addresses, the issue and resource papers, and summaries of the problems and recommendations developed in workshop sessions are documented. Subject papers include: Trends in Transit Performance; Concepts and Indicators; Revenue Policy and Pricing; Service Characteristics; Labor Management Relations; Internal Management; Transit Performance Indicators; Case Studies of New York City, Southern California Rapid Transit District, and Seattle Metro; and Effects of Fare Charges. An annotated bibliography and lists of conferees, members of the planning group, and technical advisors are reported. GRA

N79-21951# Weston Environmental Consultants-Designers, West Chester, Pa.
MULTIPLE WATER SUPPLY APPROACH FOR URBAN WATER MANAGEMENT Final Report
Arun K. Deb 15 Nov. 1978 187 p refs
(Grant NSF ENV-76-18499)
(PB-290203/9; NSF/RA-780350) Avail: NTIS HC A09/MF A01 CSCL 13B

A systems model for technical and economic analysis of an urban water system having multiple sources and multiple distribution systems is described. Background information on multiple water systems, a description of the collection and analysis of water demand data used in developing the system, water quality and treatment requirements in water supply systems, optimization in the design of pumping stations, development of the systems model, and application methodology are presented. Bottled water supply as an alternative to the potable system and point-of-use water treatment as an alternative to the potable system are analyzed and evaluated. The computer systems model developed is described in terms of function, design, capabilities, design restraints, hardware requirements, and functional aspects. GRA

N79-21952# Geological Survey, Portland, Oreg. Water Resources Div.
MULTIPLE REGRESSION MODELING APPROACH FOR REGIONAL WATER QUALITY MANAGEMENT Final Report, 30 Jun. 1975 - 31 Dec. 1977
D. J. Lystrom, F. A. Rinella, D. A. Rickert, and L. Zimmermann Oct. 1978 68 p refs
(Contract EPA-IAG-D5-0792)
(PB-290319/3; EPA-600/7-78-198) Avail: NTIS HC A04/MF A01 CSCL 13B

A framework is presented for compiling available data for assessing statistical relationships between water quality and several factors of climate, physiography, and land use. Seventeen water quality characteristics studied represent annual mean concentrations of calculated annual yields of suspended sediment dissolved solids and various chemical species of nitrogen and phosphorous. Usable multiple-linear regressions were developed relating water quality characteristics to basin characteristics for 14 of 17 water quality characteristics with standard errors of estimate ranging from 17 to 75 percent. GRA

N79-21953# American Water Works Association Research Foundation, Denver, Colo.
WATER REUSE HIGHLIGHTS, A SUMMARY VOLUME OF WASTEWATER RECLAMATION AND REUSE INFORMATION
Richard D. Heaton and Eugene Rehfield Jan. 1978 123 p refs Sponsored by Dept. of Interior and EPA
(PB-289386/5; W79-01978; OWRT-T-0058(7709)(1)) Avail: NTIS HC A06/MF A01 CSCL 13B

A comprehensive summary of municipal wastewater reclamation and refuse information is presented. Advanced wastewater treatment related conferences, health effects research, legislative and funding activities, modeling, position statement, published literature, regulations, water reuse plans and demonstrations are discussed. GRA

N79-21954# Environmental Protection Agency, Washington, D. C. Municipal Construction Div.
MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS PROGRAM, SUPPLEMENT NO. 6
Jun. 1978 14 p refs
(PB-290177/5; EPA-MCD-02.6) Avail: NTIS HC A02/MF A01 CSCL 13B

This Handbook contains the replacement pages and policy directives after the Manual of References (MCD-02) was published. This represents the sixth in a series of Program Requirements Memoranda. GRA

N79-21955# Texas A&M Univ., College Station. Water Resources Inst.
A CROSS-SECTIONAL INVESTIGATION OF THE DETERMINATION OF URBAN RESIDENTIAL WATER DEMAND IN THE UNITED STATES, 1960 AND 1970
Henry S. Foster, Jr. and Bruce R. Beattie May 1978 63 p refs
(PB-290714/5; TR-86; W79-04003; OWRT-A-999-TEX(7)) Avail: NTIS HC A04/MF A01 CSCL 13B

An economic model was developed relating residential demand for urban water to its determinants. Parameters of the model were estimated on the basis of pooled data representing a cross section of U.S. cities. Dummy variables were incorporated to estimate a regionalized version of the model, and for estimates of size of city effects. The hypothesis, water demand is invariant among regions, was tested and rejected; the hypothesis, water demand is invariant among size-of-city catagories, could not be rejected. The models were fitted using 1960 and 1970 data and ordinary least squares regression techniques; the explanatory variables, price, income, precipitation (during the growing season), and the number of residents per meter, were included. Income and price elasticities are given for all regions at the mean price level and for one standard and deviation above and below the mean price level. GRA

N79-21956# Seaward, Inc., Falls Church, Va.
DEVELOPMENT OF A SORBENT DISTRIBUTION AND RECOVERY SYSTEM Final Report
Sidney H. Shaw, Richard P. Bishop, and Robert J. Powers Nov. 1978 78 p refs
(Contract EPA-68-03-2138)
(PB-290347/4; EPA-600/7-78-217) Avail: NTIS HC A05/MF A01 CSCL 13B

The design, fabrication, and test of a prototype system for the recovery of spilled oil from the surface of river, estuarine, and harbor waters are described. The system utilizes an open cell polyurethane foam in small cubes to absorb the floating oil. The system is highly mobile and can be transported in two pickup trucks. The sorbent is transported and distributed over the water surface by means of a pneumatic broadcaster. An inclined, open wire mesh belt conveyor is used to remove the saturated sorbent from the water. The recovered oil and water is removed from the sorbent by squeezing in a converging belt press or regenerator. After regeneration, the foam is reapplied to the oil slick. The foam can be reused for a great many cycles. Tests of the system, using both diesel fuel and lubricating oil, were conducted. GRA

N79-21957# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
DYNAMIC STOCHASTIC CONTROL OF FREEWAY CORRIDOR SYSTEMS: SUMMARY AND PROJECT OVERVIEW Final Report, Apr. 1975 - Sep. 1977
Michael Athans, Stanley B. Gershwin, and Paul K. Houpt Dec. 1978 73 p refs
(Contract DOT-TSC-849)
(PB-291316/8; DOT-TSC-RSPA-78-12) Avail: NTIS HC A04/MF A01 CSCL 13B

A summary and overview of the results obtained in the completion of the contract 'Application of Modern Control Theory to Urban Freeway Corridor Control' is presented. The focus of this activity was to develop systematic methodological approaches to overall traffic management from both short-term and long-term perspectives. A formulation and a solution of interrelated mathematical problems from operations research and optimal control theory, are described. Theoretical results and designs are evaluated using a variety of computer simulation tools. Practical management is addressed in all phases of the research through decomposition and decentralization techniques. GRA

N79-21958# Polytechnic Inst. of New York, Brooklyn. Dept. of Transportation Planning and Engineering.
ANALYSIS OF PEDESTRIAN CROSSWALK SAFETY ON ONE-WAY STREET NETWORKS Final Report
P. A. Habib, R. P. Edelstein, and O. I. Nwankwor Sep. 1978 74 p refs
(Contract DOT-OST-70057)
(PB-291328/3; DOT-RSPA/DPB-50/78/28) Avail: NTIS HC A04/MF A01 CSCL 13B

Causal factors controlling accidents experienced on crosswalks of intersections on oneway street networks help local traffic engineers and policy makers to accommodate these unique characteristics in planning, controlling or redesigning oneway street networks. The New York City Police accident file was

used to determine why left-turning vehicles are at least twice as probable to strike a pedestrian in a crosswalk than right-turning vehicles. The analysis indicates that the principal factor is driver visibility. This visibility is primarily associated with vehicle design and configuration, and lighting. Guidelines for further investigation are presented. GRA

N79-21959# Oregon Legislative Assembly, Salem. Joint Interim Task Force on Transportation Policies and Funding.
REPORT OF THE JOINT INTERIM TASK FORCE ON TRANSPORTATION POLICIES AND FUNDING
Mar. 1978 91 p refs
(PB-291498/4) Avail: NTIS HC A05/MF A01 CSCL 13B

The primary purpose of the task force is to review the Oregon Department of Transportation policy as presented in the 1977 policy document and also review the statewide transportation plan. This review is made in the context of available and projected revenues and includes a review of options available to the state in the event the referral of funding measures by the legislature and by initiative results in failure of the measure. The task force also addresses the issues related to highway versus non-highway use of highway funds. GRA

N79-21960# Tennessee Univ., Knoxville.
EFFECTS OF WASTEWATER PROCESS OPERATION ON ORGANICS IN POTABLE WATER SUPPLIES
Connie Aemisegger, William P. Bonner, Rafael B. Bustamante, and Richard W. Lowhorn Dec. 1978 120 p refs
(Contract DI-14-34-0001-8045)
(PB-291340/8; W79-02815; OWRT-A-048-TENN(1)) Avail: NTIS HC A06/MF A01 CSCL 13B

The primary purpose was to ascertain whether the soluble chemical oxygen demand (COD) discharged from a typical film-type biological treatment plant is residual or refractory in origin and the extent to which nitrification takes place. This research should also determine where and under what conditions transformations between residual and refractory compounds occur in biological film treatment units. The experimental work was conducted on a 16 stage laboratory scale rotating biological contactor typical of fixed film-type treatment processes. Feed consisted of a chemically defined source of carbon, glucose, plus essential nutrients and trace metals. Soluble COD, glucose, ammonia, nitrite, nitrate and specific low molecular weight volatile organics were determined as a function of treatment stage, pH, and rotational speed. The soluble organics in the effluent of the laboratory scale treatment unit were refractory. GRA

N79-21961# Bureau of Mines, College Park, Md. Avondale Metallurgy Research Center.
RECOVERING GLASS FROM URBAN REFUSE BY FROTH FLOTATION
J. H. Heginbotham 1978 28 p refs
(PB-287771/8; BM-RI-8327) Avail: NTIS HC A03/MF A01 CSCL 13B

Batch flotation tests show that cullet quality glass products can be obtained from glass-rich aggregates derived from municipal incinerator residues and unburned refuse. This was confirmed by pilot plant operations treating 350 pounds of flotation feed per hour. Aggregates containing 85 to 90 percent glass were ground to minus 20 mesh and fed to flotation cells in water suspension after 2-stage desliming. The glass was selectively floated using an amine collector, usually in an amount under 0.2 pound per ton of solids in the feed. Over 90 percent of the glass in the destined feed was recovered in the cleaned concentrates. Flotation tailings consisted mostly of ceramic and rock fragments. GRA

88 SPACE SCIENCES (GENERAL)

N79-21962*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VISCOSITY AND THERMAL CONDUCTIVITY OF MODEL JUPITER ATMOSPHERES
C. Frederick Hansen Apr. 1979 26 p refs
(NASA-TM-78556; A-7775) Avail: NTIS HC A03/MF A01

The viscosity and thermal conductivity coefficient are estimated for three models of the atmosphere of Jupiter: a heavy model consisting of 22% helium and 78% hydrogen, a nominal model consisting of 11% helium and 89% hydrogen, and a light model consisting of pure hydrogen. The effect of trace elements is neglected. Linearized approximations are used for the transport coefficients of the mixtures; these are found to be in almost constant ratio to the values for pure hydrogen, independent of temperature. Short Basic language programs for computing the coefficients are listed. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N79-21963*# Alabama Univ. in Huntsville. Cosmic Ray Laboratory.
INVESTIGATIONS IN COSMIC AND GAMMARAY ASTRONOMY AND NUCLEAR INSTRUMENTS Annual Report
Feb. 1979 17 p refs
(Contract NAS8-31895)
(NASA-CR-161198) Avail: NTIS HC A02/MF A01 CSCL 03A

Work has continued throughout the reporting period on reduction of data from the Fall 1976 flight of the MSFC-UAH Cosmic Ray Experiment. During this period a major effort was undertaken to improve and rebuild the experiment. This was accomplished and a successful flight was completed in September 1978 from Pierre, South Dakota with the new instrument. Author

N79-21964*# Lowell Observatory, Flagstaff, Ariz.
THE ABILITY OF THE SPACE TELESCOPE TO DETECT EXTRA-SOLAR PLANETARY SYSTEMS
W. A. Baum 1979 18 p refs
(Grant NGR-03-003-001)
(NASA-CR-158455) Avail: NTIS HC A02/MF A01 CSCL 03A

The space telescope can plan a key role in searching for and investigating the contents of extra-solar planetary systems. For about 90 nearby stars, positional variations due to major planets would be well within the astrometric capability of the wide-field/planetary camera system. Since the centroids of star images will be determined to within a milliarcsecond down to 22d magnitude, there will be an abundance of reference stars at very small angular distances from each planetary system candidate, and they will have small enough motions of their own to provide a reference frame of the stability required. Author

N79-21965*# Grumman Aerospace Corp., Bethpage, N.Y.
AN ANALYSIS OF WATER IN GALACTIC INFRARED SOURCES USING THE NASA LEAR AIRBORNE OBSERVATORY Final Report, 2 Jan. 1975 - 31 Mar. 1978
Lewis L. Smith and Theodore Hilgeman Mar. 1979 81 p refs
(Contract NAS2-8664)
(NASA-CR-152262; RM-684) Avail: NTIS HC A05/MF A01 CSCL 03A

The Michelson interferometer system on the NASA Lear Jet Airborne Observatory is described as well as the data reduction procedures. The objects observed (standard stars, M stars, a nebula, planets, and the moon) are discussed and the observing parameters are listed for each flight date. The spectra obtained from these data flights are presented, grouped by class of object. A.R.H.

N79-21966*# National Aeronautics and Space Administration, Washington, D. C.
THE LIST OF THE STARS FROM THE TWO-MICRON SKY SURVEY: A PRELIMINARY CATALOG BY G. N. NEUGEBAUER et al (IRC), THE IDENTIFICATION OF WHICH IS NOT CORRECT

B. V. Kukarkin Mar. 1979 4 p Transl. into ENGLISH from Astron. Tsirvulyar (USSR), no. 674, 14 Feb. 1972 p 7-8 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75423) Avail: NTIS HC A02/MF A01 CSCL 03A

Two tables are published. The first presents the numbers of stars according to the Catalog IRC for which all or part of the identification with the Catalogs BS-HR, GC or DM is incorrect. The second table presents the numbers of stars in the IRC catalog, for which the identifications with variable stars printed with them are erroneous, whereas other identifications are usually correct. G.Y.

N79-21967*# National Aeronautics and Space Administration, Washington, D. C.
THE NEW IDENTIFICATIONS OF THE VARIABLE STARS WITH THE STARS FROM THE "TWO-MICRON SKY SURVEY: A PRELIMINARY CATALOG" BY G. NEUGEBAUER ETAL (IRC)
B. V. Kukarkin Mar. 1979 6 p refs Transl. into ENGLISH from Astron. Tsirk. (USSR), no. 674, 14 Feb. 1972 p 4-7 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by State Astron. Inst., Moscow
(Contract NASw-3199)
(NASA-TM-75422) Avail: NTIS HC A02/MF A01 CSCL 03A

A list of 151 variable stars is presented. The identification of 148 of them is beyond any doubt. The identification of 3 stars is quite probable, but requires further checking. J.M.S.

N79-21968*# National Aeronautics and Space Administration, Washington, D. C.
ON THE ORIGIN OF A VERY CLOSE SIMILARITY BETWEEN THE SPECTRA OF THE SUPERNOVA TYPE 1 IN NGC 3198 AND THE ABSORPTION OF DQ HeR
E. R. Mustel Mar. 1979 7 p refs Transl. into ENGLISH from Astro. Tsirk. (USSR), no. 674, 14 Feb. 1972 p 1-4 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75421) Avail: NTIS HC A02/MF A01 CSCL 03A

The type 1 supernova discovered late in 1966 in NGC 3198 has broad minima in its spectrum break down into a number of significantly narrower absorption bands. The broad minima of tau, sigma and mu, which usually show no details in the spectra of type supernovas, contain a number of narrow absorption bands. The reality of most of these absorption bands is demonstrated by comparison of recordings of spectra of the supernova presented for two moments in time. These minima (particularly of tau and mu,) are a result of blending of several broad absorption bands. The minimum of tau should be a blend of intensive and very broad Fe absorption lines, in which the lower level is metastable. The wavelengths of these line are: 5169, 5198, 5235, 5276, 5317, 5363A. A.R.H.

N79-21969# National Technical Information Service, Springfield, Va.
QUASARS, PULSARS, AND BLACK HOLES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Feb. 1979
Brian Carrigan Mar. 1979 260 p Supersedes NTIS/PS-77/0168; NTIS/PS-76/0134; NTIS/PS-75/225 (NTIS/PS-79/0076/4; NTIS/PS-78/0161; NTIS/PS-77/0168; NTIS/PS-76/0134; NTIS/PS-75/225) Avail: NTIS HC $28.00/MF $28.00 CSCL 03B

Astronomical surveys of quasars, pulsars, and black holes are cited. Computer simulations, mathematical models, and other methods used for the verification of hypotheses about astrophysical processes are included. GRA

N79-21511*# Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
HOW DO EARTH TIDES AFFECT ASTRONOMERS?
Tetsuo Sasao *In* Ohio State Univ. Appl. of Geodesy to Geodyn., an Intern. Symp. 1978 p 341-343 (For primary document see N79-21460 12-42)
Avail: NTIS HC A16/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N79-21970 Florida Univ., Gainesville.
TIDAL INTERACTIONS BETWEEN M81, M82, AND NGC 3077 Ph.D. Thesis
David John Killian 1978 101 p
Avail: Univ. Microfilms Order No. 7907759

The system of galaxies consisting of the galaxies M81, M82, and NGC 3077 is a peculiar system. The principal member, M81, is optically a large, beautifully symmetrical spiral galaxy. The other two members belong to the rare and optically unusual IO or Ir2 class of galaxies, and they are noted for their peculiar structure and stellar distribution. Radio observations revealed a vast cloud of neutral hydrogen (H1) that envelops all three galaxies, as well as extensive H1 bridges connecting the two smaller members of the system with M81. Numerical models of this system were made to see if the H1 bridges could be products of a tidal interaction between the three galaxies. The consequences of these models are potentially important in the interpretation of this system of galaxies. Dissert. Abstr.

N79-21971 California Univ., Los Angeles.
TIDAL EFFECTS OF PROTOSTARS ON FORMATION OF THE SOLAR NEBULA Ph.D. Thesis
Michael Kobrick 1978 80 p
Avail: Univ. Microfilms Order No. 7907665

There are two angular momentum (AM) problems associated with the formation of stars in general and the solar system in particular. The first is how to dispose of the AM possessed by turbulent protostellar clouds. The first problem is solved by postulating the fragmentation of massive clouds with most of the AM ending up in the relative orbits. The second problem is the uneven distribution of AM with mass in the solar system. It turns out that the collapse time for the majority of the infalling material is comparable to the time necessary for significant dynamical interaction of the protostellar fragment with its neighbors. It is found that the last few tens of percent of infalling material can easily have sufficient AM transferred to it by the tidal action of passing protostars to form a solar nebula and ensure alignment of the solar spin. Dissert. Abstr.

N79-21972 Wisconsin Univ. - Madison.
POLARIZATION IN REFLECTION NEBULAE Ph.D. Thesis
Richard Lee White 1978 144 p
Avail: Univ. Microfilms Order No. 7823771

The scattering properties, including both intensity and polarization, of the dust mixture which were found to provide the best fit to the observed interstellar extinction are calculated. Simple empirical parameters necessary to approximately describe all elements of the scattering matrix are derived. The reflection of polarized light from an optically thick slab of dust were theoretically calculated. Observations of polarization in the Orion Nebula are interpreted with a model consisting of a hemispherical shell of dust in front of an optically thick slab in an effort to learn something about the single-scattering polarization properties of interstellar grains. Dissert. Abstr.

N79-21973*# Maryland Univ., College Park. Dept. of Physics.
OBSERVED DISTRIBUTION FUNCTIONS OF H, He, C, O, AND Fe IN COROTATING ENERGETIC PARTICLE STREAMS: IMPLICATIONS FOR INTERPLANETARY ACCELERATION AND PROPAGATION
G. Gloeckler, D. Hovestadt (Max-Planck-Institut fur Physik und Astrophysik, Munich), and L. A. Fisk (New Hampshire Univ.) 7 Feb. 1979 16 p refs
(Contract NAS5-11063; Grant NGR-21-002-224; Grant NGR-21-002-316)
(NASA-CR-158475; PP-79-142; TR-79-080) Avail: NTIS HC A02/MF A01 CSCL 03B

Distribution functions for H, He, C, O, and Fe derived from our IMP 8 measurements of approximately 0.15 to approximately 8 MeV/nucleon particles in three corotating streams observed near earth are shown to have a simple exponential dependence

on the particle speed. The e-folding speed, v sub o, is typically 0.01c, is found to be the same for the distribution functions of all elements examined, and varies little from one corotating event to the next. The relative abundances of energetic particles in these events resemble most closely the solar coronal composition and, thus, presumably that of the solar wind. These results may imply that the acceleration of these particles, which occurs in corotating interaction regions at several AU from the sun, is by a statistical process. Author

N79-21974# National Technical Information Service, Springfield, Va.
COSMOLOGY. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Feb. 1979
Brian Carrigan Mar. 1979 135 p Supersedes NTIS/PS-78/0089; NTIS/PS-77/0116; NTIS/PS-76/0126; NTIS/PS-75/242
(NTIS/PS-79/0118/4; NTIS/PS-78/0089; NTIS/PS-77/0116; NTIS/PS-76/0126; NTIS/PS-75/242) Avail: NTIS HC $28.00/MF $28.00 CSCL 03B

Studies of cosmology and cosmological models are cited. The origin of the universe is studied by the aid of nuclear reactions, relativity, and astrophysical research. GRA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N79-21975*# Texas Univ., Galveston. Geophysics Lab.
THE APOLLO PASSIVE SEISMIC EXPERIMENT Final Technical Report
Gary V. Latham, H. J. Dorman, P. Horvath, A. K. Ibrahim, J. Koyama, and Y. Nakamura 1 Mar. 1979 14 p refs
(Contract NAS9-14581)
(NASA-CR-160142) Avail: NTIS HC A02/MF A01 CSCL 03B

The completed data set obtained from the 4-station Apollo seismic network includes signals from approximately 11,800 events of various types. Four data sets for use by other investigators, through the NSSDC, are in preparation. Some refinement of the lunar model based on seismic data can be expected, but its gross features remain as presented two years ago. The existence of a small, molten core remains dependent upon the analysis of signals from a single, far-side impact. Analysis of secondary arrivals from other sources may eventually resolve this issue, as well as continued refinement of the magnetic field measurements. Evidence of considerable lateral heterogeneity within the moon continues to build. The mystery of the much meteoroid flux estimate derived from lunar seismic measurements, as compared with earth-based estimates, remains; although, significant correlations between terrestrial and lunar observations are beginning to emerge. Author

N79-21976*# Little (Arthur D.), Inc., Cambridge, Mass.
INFRARED SPECTRA OF LUNAR SOILS Annual Progress Report, Jan. 1978 - Mar. 1979
J. R. Aronson, A. G. Emslie, and E. M. Smith Mar. 1979 15 p refs
(Contract NAS9-15356)
(NASA-CR-160145) Avail: NTIS HC A02/MF A01 CSCL 03B

Measured data obtained by Michelson interferometer spectrometer were stored in a computer file and smoothed by being passed forward and backward through a digital four-pole low pass filter. Infrared spectra of the 10 lunar samples are presented in the format of brightness temperature versus frequency. The mol % of feldspar, pyroxene, olivine, ilmenite and ferromagnetic silicate in each sample is presented in tables. The reflectance spectra of ilmenite and enstatite are shown in graphs. A.R.H.

N79-21977*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIELD MEASUREMENTS OF PENETRATOR SEISMIC COUPLING IN SEDIMENTS AND VOLCANIC ROCKS
Yosio Nakamura (Texas Univ., Galveston), Gary V. Latham (Texas Univ., Galveston), Cliff Frohlich (Texas Univ., Galveston), Maxwell B. Blanchard (Johnson Space Center, Houston, Tex.), and James P. Murphy Apr. 1979 60 p
(NASA-TM-78572; A-7770) Avail: NTIS HC A04/MF A01 CSCL 03B

Field experiments were conducted to determine how well a seismometer installed using a penetrator would be coupled to the ground. A dry-lake bed and a lava bed were chosen as test sites to represent geological environments of two widely different material properties. At each site, two half-scale penetrators were fired into the ground, a three-component geophone assembly was mounted to the aft end of each penetrator, and dummy penetrators were at various distances to generate seismic signals. These signals were detected by the penetrator-mounted geophone assembly and by a reference geophone assembly buried or anchored to surface rock and 1-m from the penetrator. The recorded signals were digitized, and cross-spectral analyses were performed to compare the observed signals in terms of power spectral density ratio, coherence, and phase difference. The analyses indicate that seismometers deployed by penetrators will be as well coupled to the ground as are seismometers installed by conventional methods for the frequency range of interest in earthquake seismology. A.R.H.

N79-21978# Bern Univ. (Switzerland). Physikalisches Inst.
PRE-IMBRIAN CRATERS AND BASINS: AGES COMPOSITIONS AND EXCAVATION DEPTHS OF APOLLO 16 BRECCIAS
P. Maurer, P. Eberhardt, J. Geiss, N. Groegler, A. Stettler, G. M. Brown (Durham Univ.), A. Peckett (Durham Univ.), and U. Kraehenbuehl May 1978 88 p refs Revised Submitted for publication
Avail: NTIS HC A05/MF A01

Breccia fragments were analyzed from the 2-4 mm sieve fraction of three Apollo 16 soils collected in the vicinity of North Ray Crater. The Ar39-Ar40 ages, Ar37-Ar38 exposure ages, abundances of major and certain trace elements, and petrographic data relevant to thermal history were obtained for up to 48 individual fragments. Among the samples, 30 gave Ar39-Ar40 release patterns that allowed the assignment of a high- or intermediate-temperature plateau age and the recognition of three age groups. The oldest fragments are all anorthositic metamorphosed breccias of light-matrix type. The younger fragments are noritic anorthosite and anorthositic norite breccias with textures indicative of greater annealing (melted matrix), one totally melted sample being of KREEP-basalt texture. The very young fragments are chiefly of glass or devitrified glass. The results are interpreted as reflecting two magnitudes of cratering. A.R.H.

N79-21979*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
OUTER SATELLITE ATMOSPHERES: THEIR NATURE AND PLANETARY INTERACTIONS Final Report, Jun. - Dec. 1978
William H. Smyth Dec. 1978 83 p refs
(Contract NASw-3174)
(NASA-CR-158482) Avail: NTIS HC A05/MF A01 CSCL 03B

Results show that Amalthea is likely to form a tightly-bound partial toroidal-shaped hydrogen cloud about its planet, while Ganymede, Callisto and Titan may have rather large, complete and nearly symmetric toroidal-shaped clouds. The toroidal cloud for Amalthea compares favorably with spacecraft data of Pioneer 10 for a satellite escape flux of order 10 to the 11th power atoms/sq cm/sec. Model results for Ganymede, Callisto and Titan suggest that these extended hydrogen atmospheres are likely to be detected by the Voyager spacecrafts and that Titan's cloud might also be detected by the Pioneer 11 spacecraft. Ions created because of atoms lost through ionization processes from these four extended hydrogen atmospheres and from the sodium cloud of Io are discussed. A.R.H.

N79-21980# General Electric Co., Philadelphia, Pa.
GALILEO PROBE BOUNDARY LAYER COMPOSITION AND RADIATION TRANSFER
M. H. Bortner 27 Apr. 1979 35 p refs
(Doc-79SDS016) Avail: NTIS HC A03/MF A01 CSCL 03B

The nonequilibrium chemistry in the boundary layer of the Galileo probe was calculated using an expanded chemistry system. Concetrations of C3 are significantly greater than equilibrium values. In the spectral range 2950 to 5140A (4.2 to 2.2 eV) 22% less radiation reaches the wall at station 16 than would if equilibrium prevailed. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N79-21981*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
CARBON-POOR SOLAR FLARE EVENTS
G. M. Mason, G. Gloeckler, and D. Hovestadt (Max-Planck-Inst. fuer Physik und Astrophysik, Munich, West Germany) 20 Feb. 1979 17 p refs
(Contract NAS5-11063; Grant NGL-21-002-224)
(NASA-CR-158470; TR-79-065; PP-79-143) Avail: NTIS HC A02/MF A01 CSCL 03B

Energetic particle flux enhancements over the period October 1973 - December 1977 were surveyed using ULET sensor on the IMP-8 spacecraft. During the four year period the most extreme periods of Fe enrichment compared to oxygen were during solar flare events in February 1974 and May 1974. In these same events, the carbon abundance with respect to oxygen was significantly depleted when compared with a value C:O is approximately 0.45:1 for typical solar flares. These observations, taken together with previously reported He-3 enrichment in these events, give strong evidence for the importance of a wave-particle interaction in the pre-injection heating of the ambient matter. A.R.H.

N79-21982# Boston Univ., Mass. Dept. of Astronomy.
SYNOPTIC CHARTS OF CORONAL HOLES AND 9.1 cm SOLAR DATA FROM MAY THROUGH AUGUST 1973
Fred L. Wefer, Michael D. Papagiannis, Michael E. VanSteenberg, and Terry M. Varner Jan. 1979 32 p refs
(Contract F19628-77-C-0189)
(AD-A063258; Ser-2-No-68; AFGL-TR-78-0284; SR-2) Avail: NTIS HC A03/MF A01 CSCL 03/2

The introduction reviews the geomagnetic disturbances due to high-speed solar wind streams produced by coronal holes and discusses the history of radio observations of coronal holes. In the main part of this work, using the central meridian column of the 9.1 cm Stanford solar radio maps, the authors constructed synoptic charts emphasizing temperatures near the quiet solar disk level. Synoptic charts were made for Carrington Rotations 1601-1605 (May - August 1973) which represents the overlapping period from the commencement of solar X-Ray data from ATM - Skylab (28 May 1973) to the termination of the Stanford solar radio mapping program (11 August 1973). Synoptic charts of coronal holes were superimposed on the radio charts to determine if the 9.1 cm synoptic charts could be used to identify coronal holes. Their findings lead them to conclude that the 9.1 cm synoptic charts can be of substantial value in identifying large coronal holes, especially during periods of low solar activity. Such synoptic charts, especially during the 1962-65 period of low solar activity, could strengthen the confidence on coronal hole boundaries in the 1960-1973 pre-Skylab period. GRA

N79-21983# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. Environmental Data Service.
SOLAR-GEOPHYSICAL DATA NUMBER 411, NOVEMBER 1978. PART 1: PROMPT REPORTS, DATA FOR OCTOBER 1978, SEPTEMBER 1978
Helen B. Coffey, ed. Nov. 1978 163 p
(PB-291866/2; SGD-411-Pt-1; NOAA-78121401) Avail: NTIS HC A08/MF A01 CSCL 03B

This prompt report provides data for October 1978 on: alert period, daily solar indices, solar flares, solar radio waves, solar X-ray radiation, coronal holes, solar wind measurements, inferred IP magnetic field polarities, mean solar magnetic field, and Boulder geomagnetic substorm log. It also provides data for September 1978: daily solar activity center, sudden ionospheric disturbances, solar X-ray radiation, solar radio waves, cosmic rays, geomagnetic indices and radio propagation indices. GRA

N79-21984# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. Environmental Data Service.
SOLAR-GEOPHYSICAL DATA NUMBER 411, NOVEMBER 1978. PART 2: COMPREHENSIVE REPORTS, DATA FOR MAY 1978, APRIL 1978 MISCELLANEA
Helen B. Coffey, ed. Nov. 1978 95 p
(PB-291867/0; SGD-411-Pt-2; NOAA-78121402) Avail: NTIS HC A05/MF A01 CSCL 03B

This comprehensive report provides data for May 1978 on: active regions, synoptic solar maps, solar flares, solar radio waves, and energetic solar particles and plasma. It also provides a synoptic chart, abbreviated calendar record, and regional flare index for April 1978. The miscellaneous data includes solar X-ray radiation, cosmic rays, solar radio waves, geomagnetic indices, and energetic solar particles and plasma. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N79-21985 Maryland Univ., College Park.
MEASUREMENT OF THE ARRIVAL TIME DISTRIBUTION OF ENERGETIC HADRONS WITH RESPECT TO COSMIC RAY AIR SHOWER FRONTS Ph.D. Thesis
Jordan Alvin Goodman 1978 181 p
Avail: Univ. Microfilms Order No. 7908853

If new stable (lifetime > 10 to the -8th power sec) heavy hadrons exist, they may have a signature of long delay and high energy in this type of experiment. Data is presented in which several events are seen with both long delay and large pulse height in the calorimeter. Alternative conventional explanations for these events are shown to be inconsistent with the observed flux. A Monte Carlo simulation shows that these events are not predicted without new processes. A small fraction (.5%) of the data is shown to have appreciable delay and low pulse height. The Monte Carlo results are used to show that these events are consistent only with a primary composition which has a significant fraction of heavy (iron) nuclei at total energies above 10 to the 14th power eV. Dissert. Abstr.

N79-21986*# Stanford Univ., Calif.
POSITRON PRODUCTION BY PULSARS
Peter Sturrock and Kile B. Baker Feb. 1979 14 p refs
(Grant NGR-05-020-668)
(NASA-CR-158459; SU-IPR-720) Avail: NTIS HC A02/MF A01 CSCL 03B

Calculations based on two specific pulsar models show that in either case the 511 keV gamma-ray line from the galactic center can be explained as the as the result of the annihilation of positrons produced by pulsars. Author

99 GENERAL

N79-21987# Aerospace Medical Div., Brooks AFB, Tex.
AMD FISCAL YEAR 1980: AIR FORCE TECHNICAL OBJECTIVE DOCUMENT Final Report
Thomas D. N. Douthit 1979 66 p Supersedes AMD-TR-77-1 (AD-A063412; AMD-TR-78-1; AMD-TR-77-1) Avail: NTIS

HC A04/MF A01 CSCL 06/5

This TOD describes the planning methodology used within AMD laboratories: seven technology areas to achieve our technical goals. Specifically, efforts are directed in the biotechnology program to man's adaptability, survivability, and performance capabilities within his operational environment. This research and development of AMD's functions is accomplished as disciplinary work by teams of biomedical scientists, engineers and physical scientists within the Air Force laboratories and the industrial and academic research and development communities.

Author (GRA)

N79-21988# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

AIR FORCE FLIGHT DYNAMICS LABORATORY FISCAL YEAR 1980: TECHNICAL OBJECTIVE DOCUMENT

Dec. 1978 74 p Supersedes AFFDL-TR-78-6 (AD-A063384; AFFDL-TR-78-181; AFFDL-TR-78-6) Avail: NTIS HC A04/MF A01 CSCL 01/3

The document presents an overview of the four Technical Planning Objectives (TPO) and supporting data for each. These are extracted from the technical plan of the Air Force Flight Dynamics Laboratory (AFFDL). Information is largely based on AFFDL fiscal 1980 technology plan omitting specific funding and timing information of an 'Official Use Only' nature. Technical objectives are described for the technical areas of Structural Mechanics, Vehicle Equipment/Subsystems, Flight Control and Aeromechanics. Points of contact for more information in each of the areas are identified. Author (GRA)

N79-21989# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: PHYSICAL SCIENCES AND TECHNOLOGY, NO. 63

26 Mar. 1979 62 p refs Transl. into ENGLISH from various Russian journals (JPRS-73084) Copyright. Avail: NTIS HC A04/MF A01

Research of automated programming systems and applications for minicomputers and microcomputer technologies is presented. A method for determining the angular position of objects and the realization of harmonic functions in discretely controlled equivalents of rotary transformers are discussed. For individual titles, see N79-21990 through N79-21993.

N79-21990# Joint Publications Research Service, Arlington, Va.

AN AUTOMATED SYSTEM FOR PREPARING MINICOMPUTER SOFTWARE **c61**

Ye. I. Belyavskiy, A. F. Kapoyko, and I. A. Sennius *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 63 (JPRS-73084) 26 Mar. 1979 p 19-25 refs Transl. into ENGLISH from Upravlyayushchiye Sistemy i Mashiny (Kiev), no. 5, Sep./Oct. 1978 p 54-57 (For primary document see N79-21989 12-99)

Copyright. Avail: NTIS HC A04/MF A01

The development of an automated system for preparing minicomputer program is presented. The method requires language and programming support and utilizes a large general purpose computer for producing the basic stages of a software system. This unified system computer has a high level instruction system convenient for designing compilers and debugging programs, and for simulating minicomputer instructions. Its standard hardware contains direct assess memory units which increase the efficiency of the automated systems for program production for archive service. M.M.M.

N79-21991# Joint Publications Research Service, Arlington, Va.

AUTOMATED PROGRAMMING SYSTEMS FOR MICROCOMPUTERS DISCUSSED **c61**

Yu. V. Ivanov, Yu. A. Maslenikov, N. Ye. Chebykin, A. V. Shebarin, and I. V. Shturts *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 63 (JPRS-73084) 26 Mar. 1979 p 26-31 refs Transl. into ENGLISH from Upravlyayushchiye Sistemy i Mashiny (kiev), no. 5, Sep./Oct. 1978 p 39-42 (For primary document see N79-21989 12-99)

Copyright. Avail: NTIS HC A04/MF A01

A system for automating programming and debugging programs (SAP) for microcomputers is presented, and an actual SAP is described. There are two methods of program preparation for microcomputers which are described. One method uses a cross assembler and cross compiler, and the programs are debugged by a computer simulator. The other method uses special debugging systems which include a real microcomputer actual peripheral equipment and minicomputers to control the debugging operations, also the external memory. A combined method is recommended in which a microcomputer program is debugged initially by means of a program simulator, and the final debugging is accomplished in the system. M.M.M.

N79-21992# Joint Publications Research Service, Arlington, Va.

A METHOD OF DETERMINING THE ANGULAR POSITION OF OBJECTS **c31**

K. L. Kulikovskiy and A. I. Shimarov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 63 (JPRS-73084) 26 Mar. 1979 p 39-43 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), no. 11, 1978 p 116-120 (For primary document see N79-21989 12-99)

Copyright. Avail: NTIS HC A04/MF A01

A method is examined for measuring rotation of an object relative to another object with respect to two mutually perpendicular axes. Analytical expressions are presented for calculating the controllable parameters, and the results of an experimental verification of the method are given. Author

N79-21993# Joint Publications Research Service, Arlington, Va.

ON ONE POSSIBILITY OF REALIZING HARMONIC FUNCTIONS IN DISCREETLY CONTROLLED EQUIVALENTS OF ROTARY TRANSFORMERS **c33**

B. V. Sychev *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 63 (JPRS-73084) 26 Mar. 1979 p 44-48 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), no. 11, 1978 p 70-74 (For primary document see N79-21989 12-99)

Copyright. Avail: NTIS HC A04/MF A01

An examination was made of the feasibility of digital realization of harmonic functions in discretely controlled equivalents of rotary transformers. The condition of symmetrizing the angular error of conversion is defined. Author

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 17 NUMBER 12

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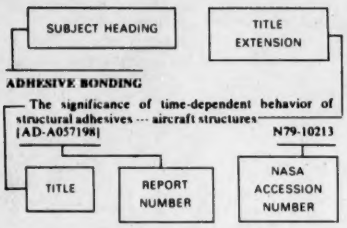

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A

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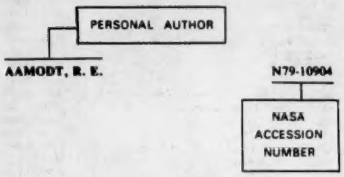

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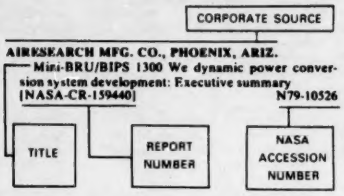

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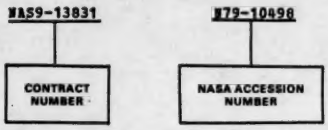

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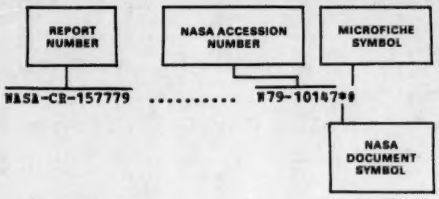

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NBSIR-78-1494 ..... N79-21167 #
NBSIR-78-1525 ..... N79-21629 #
NBSIR-78-1562 ..... N79-21630 #

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NLM-MED-79-01 ..... N79-21937 #

NLR-HP-79006-UCICAF-1081 ..... N79-21448 #

NLR-TR-77095-U ..... N79-21449 #
NLR-TR-78071-UCICAF-1060 ..... N79-21447 #

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NOAA-TM-NOS-NGS-14 ..... N79-21709 #

NOAA-TM-NWS-NSSFC-2 ..... N79-21728 #

NOAA-TM-NWS-TDL-67 ..... N79-21724 #

NOAA-78120102 ..... N79-21709 #
NOAA-78120504 ..... N79-21724 #
NOAA-78121401 ..... N79-21983 #
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NOAA-78121403 ..... N79-21513 #
NOAA-78121404 ..... N79-21728 #
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NOSC/TR-270 ..... N79-21285 #
NOSC/TR-312 ..... N79-21278 #

NPS67-78-009 ..... N79-21080 #

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NRL-MR-3830 ..... N79-21341 #
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NSF/RA-780331-VOL-2 ..... N79-21948 #
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NTIS/PS-75/109 ..... N79-21212 #
NTIS/PS-75/110 ..... N79-21214 #
NTIS/PS-75/160 ..... N79-21174 #
NTIS/PS-75/161 ..... N79-21762 #
NTIS/PS-75/177 ..... N79-21291 #
NTIS/PS-75/225 ..... N79-21969 #
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NTIS/PS-75/242 ..... N79-21974 #
NTIS/PS-75/893 ..... N79-21761 #
NTIS/PS-76/0029 ..... N79-21711 #
NTIS/PS-76/0063 ..... N79-21212 #
NTIS/PS-76/0064 ..... N79-21214 #
NTIS/PS-76/0065 ..... N79-21291 #
NTIS/PS-76/0066 ..... N79-21293 #
NTIS/PS-76/0095 ..... N79-21762 #
NTIS/PS-76/0099 ..... N79-21174 #
NTIS/PS-76/0126 ..... N79-21974 #
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NTIS/PS-77/0024 ..... N79-21788 #
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NTIS/PS-77/0091 ..... N79-21293 #
NTIS/PS-77/0116 ..... N79-21974 #
NTIS/PS-77/0119 ..... N79-21174 #
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NTIS/PS-78/0089 ..... N79-21974 #
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NTIS/PS-79/0071/5 ..... N79-21762 #
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NTIS/PS-79/0073/1 ..... N79-21711 #
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NTIS/PS-79/0118/4 ..... N79-21974 #

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NWC-TR-3333 ..... N79-21902 #

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OSURF-710300-1 (ESL) ..... N79-21251 #

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OWRT-A-048-TENN (1) ..... N79-21960 #
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OWRT-A-056-WY(6) ..... N79-21680 #
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OWRT-A-073-ARIZ(1) ..... N79-21708 #
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OWRT-A-999-TEX(7) ..... N79-21955 #

OWRT-B-026-PA(1) ..... N79-21533 #
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PB-289963/1 ..... N79-21735 #
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PB-290177/5 ..... N79-21954 #
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PB-290328/4 ..... N79-21775 #
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PB-290331/8 ..... N79-21645 #
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PB-291278/0 ..... N79-21677 #
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PB-291793/8 ..... N79-21937 #
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PB-291853/0 ..... N79-21414 #
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PB-291865/4 ..... N79-21734 #
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PB-291867/0 ..... N79-21984 #
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PB-292155/9 ..... N79-21738 #
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PP-79-143 ..... N79-21981*#

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R79-912839-24 ..... N79-21000*#
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SAMSO-TR-78-20 ..... N79-21020 #
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SC5118.3TR ..... N79-21288 #

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SF16 ..... N79-21926 #

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SR-17 ..... N79-21704 #

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SU-SOL-78-33 ..... N79-21811 #

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TN-1978-10 ..... N79-21113 #

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TR-143 ..... N79-21281 #
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TR-0079(4960-01)-1 ..... N79-21900 #
TR-0079(4960-04)-1 ..... N79-21115 #
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UILU-ENG-78-2022 ..... N79-21242 #
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UMTA-DC-06-0184-78-1 ..... N79-21950 #

UMTA-MA-06-0025-78-7 ..... N79-21945 #

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US-PATENT-APPL-SN-006952 ..... N79-21183*#
US-PATENT-APPL-SN-017888 ..... N79-21743*#
US-PATENT-APPL-SN-023485 ..... N79-21336*#
US-PATENT-APPL-SN-200770 ..... N79-21084*
US-PATENT-APPL-SN-286824 ..... N79-21539*
US-PATENT-APPL-SN-292340 ..... N79-21750*
US-PATENT-APPL-SN-395895 ..... N79-21333*
US-PATENT-APPL-SN-400857 ..... N79-21225*
US-PATENT-APPL-SN-430748 ..... N79-21910*
US-PATENT-APPL-SN-472643 ..... N79-21265*
US-PATENT-APPL-SN-474815 ..... N79-21264*
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US-PATENT-APPL-SN-581843 ..... N79-21226*
US-PATENT-APPL-SN-584914 ..... N79-21765*
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